Appendix F

Part 5

completely dominated by the fish consumption pathways. For those individuals who recreate along Clear Creek but do not consume fish from the creek, risk levels are below levels of concern at Country Club Road, Fluckmill Road, and Strain Ridge Road, as demonstrated in Table 1. At Quarry Springs, the direct contact risks are slightly higher but are near the more stringent end of EPA's acceptable risk range.

Hazard indices have also been recalculated. Results of that analysis are presented in Table 2. As for the cancer risk estimates, the fish ingestion pathway yields the highest hazards, with hazard indices ranging from 0.15 to 2.4 for the RME fish consumer. Hazards to the CTE fish consumer are well below the benchmark hazard index of 1. Aggregate hazard indices exceed 1for the RME scenario that includes the consumption of fish at Fluckmill Road and Strain Ridge Road. However, for those individuals who recreate along Clear Creek but do not consume fish from it, hazard indices are well below levels of concern.

Response: Please see Response to Comment 77.

Comment 79: Risks to Ecological Receptors Do Not Justify any of the Alternatives

Similarly, none of the alternatives are required to protect ecological resources. As in the Bennett's Dump Proposed Plan, EPA uses toxicity reference values that the latest scientific studies show to be overly conservative for the kingfisher and mink, its two indicator species. This results in an overstatement of the risk. In the Proposed Plan, EPA calculates hazardous quotients for mink and kingfishers that are just slightly above the 1.0 threshold level recognized by the Agency. *See* Proposed Plan at pp. 19-20. However, as discussed in detail in CBS's Lemon Lane Ecological Risk Assessment Comments (attached as Exhibit C and incorporated by reference), EPA has calculated these hazard quotients using overstated toxicity reference values (TRVs). If more reasonable TRVs are used, then the hazard quotients would be much lower and would not justify any further action. The proper calculation of the TRVs is explained in detail in Exhibit C.

Moreover, as also detailed in Exhibit C, although the existing ICS Treatment Facility has been in operation for six years, it has had no significant impact on EPA calculated ecological risk levels within the main stem of Clear Creek. There is no reason to suppose that Alternative 3, or any other options considered in the Proposed Plan, will measurably improve the situation in the main stem.

Response: See the responses to Comments 80 through 84.

Comment 80: The assessment for Clear Creek includes only one line of evidence, the generation of conservative hazard quotients. CBS agrees with Fairbrother (Fairbrother 2003) that this conservative line of evidence based on theoretical hazard quotients can only be used to rebut the presumption of risk, not to conclude that significant risk actually exists. The EPA has not performed any field studies that would be required to determine if these theoretical risks have actually manifested in any real population effects.

Response: The Lemon Lane Focused Ecological Risk Assessment (FERA) is consistent with Superfund guidance and practice.

Comment 81: Since the assessment uses the same TRVs that EPA has used in the other Bloomington area ERAs, CBS has the same comments made previously with respect to those TRVs. Specifically:

First bullet:

The methods used to derive some of the TRVs for both mink and birds are novel and their utility and accuracy have not been established. In particular, CBS has a number of concerns about the TRVs and the methods that were applied in deriving them that were presented in the document entitled "Toxicity Reference Values (TRVs) for Mammals and Birds Based on Selected Aroclors", from USEPA Region V, dated March 6, 2003 (which is included as a part of USEPA 2005, Focused Ecological Risk Assessment, PCBs and Mammalian and Avian Piscivores in Conard's Branch and Richland Creek, August 10). For example, the combination of data from various studies and then the extrapolation of NOAELs and LOAELs from the combined data sets have several obvious limitations, including the comparability of methods between studies. To our knowledge, these approaches have not been externally peer reviewed and are in contrast to the typical EPA method of deriving TRVs from relevant single high value studies.

Second bullet:

The TRVs for mink have been adjusted to account for two breeding seasons. It is not clear that this is a generally accepted or scientifically valid procedure. In their TRV memo, USEPA evaluated the Brunstrom et al., (2001) study and concluded that "the low effect TRV for exposure over 2 breeding seasons (1.3 ppm PCB) is 42% of the corresponding TRV for 1 season exposure (3.1 ppm), and the 2-season no effect TRV (1.1 ppm) is 47% of the 1-season value (2.4 ppm)." These TRVs are clearly artifacts of the interpolation method used by USEPA since only two doses were evaluated by Brunstrom et al., (2001) and yet USEPA derived four different TRVs from this study. Furthermore, USEPA's TRVs are based on a narrow definition that considers only a single endpoint rather than deriving a TRV based on the most sensitive, ecologically relevant endpoint(s), as is commonly done with setting a TRV. Clearly, the results of Brunstrom et al., (2001) demonstrate the toxicity of the European Clophen technical mixture. If one focuses on reduced birth weight of kits as an endpoint, then it is clear from this study that the LOAEL TRV (0.3 mg Clophen A50/mink/d or 2 mg/kg in diet) is the same for both the 6-month and 18-month exposures (compare Tables 3 and 5 in Brunstrom *et al.*, 2001). However, the more sensitive endpoints from this study were the numbers of 2-week old kits per mated female and weights of kits at 2 and 5 weeks of age. Using these more sensitive endpoints, the LOAEL is 0.1 mg Clophen A50/mink/d (or 0.67 mg/kg in feed) at the 18-month exposure. However, since the authors did not present data on these endpoints for the 6-month exposure, there is no way to directly compare TRVs for 6 and 18-month exposures for these endpoints. Thus, this study does not support the derivation of a 1-season to 2-season uncertainty factor. Similarly, USEPA's analysis of the Restum et al., (1998) study does not support a 1-season to 2-season uncertainty factor. Again, the TRVs derived from this study by USEPA are artifacts of the interpolation method used by USEPA and the narrow definition of a TRV that utilized a single endpoint rather than deriving a TRV based on the most sensitive, ecologically relevant endpoints. As before, the lowest dose tested for both seasons determined a LOAEL and therefore, the uncertainty associated with estimating a NOAEL from this study would be relative great. For example, based on the most sensitive, ecologically relevant endpoint from this study, reduced body weight of 6-week old male kits, it is clear that the LOAEL TRV (0.25 mg PCBs/kg in diet) is the same for both the 6-month and 18-month exposures (compare Tables 8 and 9 of Restum et al., 1998). Thus, this study and the other study cited by USEPA (Brunstrom et al., 2001) do not support the derivation of a 1-season to 2-season uncertainty factor. The most recent high quality studies (for example the Housatonic River fish feeding studies detailed in Bursian et al 2003) have not involved multiple breeding seasons. Similarly the USFWS is planning a similar mink feeding study with Hudson River Fish and this is also proposed as a single season study (Hudson Ever Natural Resource Trustees 2006). This is an indication that multiple breeding seasons are not judged to be a significant factor in TRV development for mink by much of the scientific community including EPA or FWS at other high profile PCB sites. If this factor was omitted, the resulting Hazard Quotients would drop by about a factor of 2.

Third bullet:

Relative to assessment of potential effects thresholds in mink, the study conducted by Michigan State University under contract with the USEPA (Bursian et al., 2003) where fish from the Housatonic River were fed to mink is the highest quality, most relevant study from which TRVs can be determined. EPA disregards this study because the original technical grade of PCBs released at the Housatonic River was Aroclor 1260. While the original PCB technical mixture released to the Housatonic River may have been different from those released at this site, it has been established that TEQs are the most accurate predictor of toxicity to mink. A variety of weathering and bioaccumulation processes have altered both the PCBs released in Bloomington streams and those released to the Housatonic. Upon review of the residue data from both the Housatonic mink feeding study and Clear Creek fish, the relative potency of the dioxin-like activity, in the units of mg TEQs/kg PCBs, were found to be lower for the Clear Creek fish than for the Bursian study fish (Table 1). Additionally, for both sites congener 126 was found to be the main contributor of TEQs. Thus, selection of this study as the basis for TRVs is relevant and likely conservative for this site. USEPA has used Aroclor 1260 field derived TRVs at sites contaminated with Aroclor 1242 in other high profile risk assessments. For example, in the Hudson River ERA (USEPA 2000), USEPA used a NOAEL TRV for great blue heron that was based on a Halbrook (Halbrook et al. 1999) field study where Aroclor 1260 was the contaminant. The main contaminant released at the Hudson River site is also Aroclor 1242, the same as at Lemon Lane Landfill.

Fourth bullet:

The TRVs used to assess toxicity for kingfishers are all from other bird species. Gallinaceous birds, such as chickens and pheasants are among the most sensitive birds with respect to exposures to PCBs and other dioxin-like chemicals. The assessment fails to evaluate recent scientific evidence that kingfishers may be much less sensitive than any of these birds. This evidence is found in the Housatonic field studies (Henning and Brooks, 2003). At the Housatonic site, where PCB levels in fish are one to two orders of magnitude greater than they are at this site, there was no noticeable impact to breeding success of native kingfishers near the site. While the original PCBs disposed of at the Housatonic site may be different from those disposed of at Clear Creek, it has been established that the TEQs are the most accurate predictor of toxicity to fish eating birds. The TEQs of the Housatonic fish when evaluated as mg TEQs/kg PCBs are similar, but higher, than those found at the Clear Creek site. This large discrepancy between predicted risk to reproduction and actual field measured reproduction shows how relying on a single line of evidence such as theoretical hazard quotients can lead to improper conclusions.

Fifth bullet:

There is a growing body of evidence that suggests that it is inappropriate to apply chicken based TRVs to piscivorous birds for TEQs. For example, studies over the last several years by a number of researchers indicate that predatory birds, such as bald eagles, ospreys, and kingfishers are much more resistant to the effects of dioxins and related chemicals (Woodford et. al., 1998; Kennedy et. al. 2003; Henning and Brooks, 2003). Elliott and Harris (2002) noted the following based on their extensive review of data for piscivorous birds:

- *In summary, the results of this study are consistent with the emerging data from both field and laboratory studies which indicate that predatory birds are not particularly sensitive to some of the effects of TCDD. Assessments based on field studies on eagles (Elliott et a!., 1996) and ospreys (Woodford et al., 1998) and the comparative egg injection work with kestrels, indicate that raptors are rather insensitive to some of the toxic and biochemical effects of TCDD and PCBs. Elliot et al., (1996) suggested a no effect level (based on hepatic CYP1A in hatchlings) of 100pg/g TEQs and a lowest effect level of 303 pg/g.*

Sixth bullet:

In summary, the raptor TEQ egg LOAEL ranges conservatively from 210 pg/g to 303 pg/g based on enzyme induction, which is not typically an endpoint chosen for an ERA since it is not an ecologically relevant endpoint and occurs at much lower concentrations than effects on reproduction and development. Furthermore, since these values are based on the induction of enzymes, it is likely that effect levels in predatory birds for ecologically relevant endpoints, such as reproductive and developmental endpoints, are much greater. If these TRVs were used in the USEPA's ERA, then the predicted risks to piscivorous birds, such as kingfishers, would be substantially less, and if other TRVs were available for such raptors, based on endpoints such as reproductive/developmental endpoints, the predicted risk would again be much less.

Seventh bullet:

CBS has previously provided EPA TRVs for the Great Blue Heron (Viacom 2004). Since the Great Blue Heron is also a predatory piscivore, the TRVs derived for the Great Blue Heron are likely more representative for the Kingfisher. CBS therefore recommends that the TRVs in Viacom 2004 for the Great Blue Heron be used for the kingfisher rather than those the EPA has derived based on Gallinaceous birds. If this substitution were made, the calculated hazard quotients would drop to about those shown for the "LOAEL" kingfisher case in EPA's risk assessment. Those hazard quotients approximate 1 based on the 2004 data set and show little risk to avian piscivores.

Response: First bullet:

Eight sets of TRVs are used in the FERA, the comments pertain to 2 of these 8 sets. The TRVs in question are based on meta-analysis of multiple toxicity studies, a procedure used to derive mink dietary no effect (500 μg total PCB/kg diet) and low effect (600 μg/kg) TRVs, and kingbird ingestion dose no effect (400 μg total PCB/kg$_{BW}$-d) and low effect (500 μg/kg$_{BW}$-d) TRVs. The remaining 6 sets of TRVs in the FERA are derived through other approaches, including a second set of kingbird PCB ingestion TRVs used to bracket uncertainty over kingbird sensitivity to PCBs.

The methods used for the meta-analysis are not novel. The approach is based on Leonards, et al. (1995), who used meta-analysis to interpolate mink tissue-based PCB TRVs on a dioxin-equivalent (TEQ) basis. The method used in the FERA for normalizing data from multiple studies to combine them into a single meta-analysis is the same as used by Leonards, et al. (1995). Other examples of the same normalization approach for meta-analysis of ecotoxicological studies include Isnard, et al. (2001), Tanaka and Nakanishi (2001), and Calabrese (2005). The main differences between the methods in the FERA and Leonard, et al. (1995) are minor ones made for site-specific objectives. The FERA meta-analysis TRVs are derived for PCBs on an individual Aroclor basis, instead of TEQs; exposure to mink is quantified on a dietary basis, instead of tissue accumulation; a different regression method is used (adapted from USEPA guidance on effluent toxicity testing); and, consistent with Superfund practice, TRVs are based on the range between no adverse effects and the onset of adverse effects, while the Leonards, et al. (1995) TRVs are based on a high incidence of adverse effects (affecting 50 % of exposed mink).

CBS incorrectly states that the TRVs are extrapolated, but the meta-analytical method in the FERA is restricted solely to interpolation within the combined data sets, and extrapolation beyond the bounds of the empirical data is not allowed.

Incompatibilities between studies because of differences in study design or other factors are potentially important limitations of meta-analysis and, therefore, are evaluated as part of the meta-analysis performed for the FERA. Significant incompatibilities between studies are revealed by inconsistencies in the exposure-response plots of the combined data sets. There are no inconsistencies among the 3 studies performed by two sets of investigators combined in the meta-analysis of PCB effects on hatchability, to the contrary, the results of the various studies are remarkably consistent with each other (Figure 1). The mink PCB TRVs are based on 4 studies performed by three sets of investigators (two separate experiments reported in Aulerich and Ringer 1977 are included in Figure 2). The results are internally consistent except for an inconsistency between studies at 1 mg/kg PCB dietary concentration (Figure 2). For the FERA, the two data points are averaged before calculating the TRVs, but, if the data point showing greater toxicity at 1 mg/kg PCB is excluded (Aulerich and Ringer 1977), and the TRVs are calculated with only the Wren, et al. (1987) data point to represent the response at 1 mg/kg PCB (showing less toxicity), the TRVs increase by no more than 15 %. Therefore, the difference between studies at this dietary concentration has only a minor influence on the calculated TRVs. Mink reproduction is consistently suppressed in treatments at or above 2 mg/kg dietary concentrations.

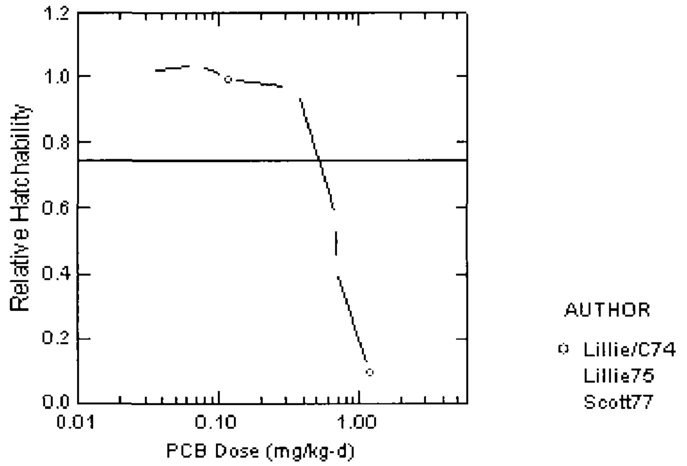

Figure 1. Hatchability, Aroclor 1248 Dose to Chicken Hens
(Lillie/C74 - Lillie, et al. 1974 and Cecil, et al. 1974 (reporting the same study); Lillie75 - Lillie, et al. 1975; Scott77 - Scott 1977)

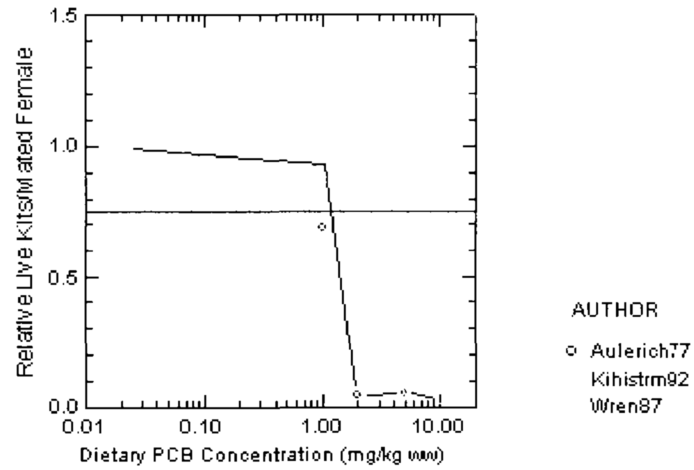

Figure 2. Live Kits per Mated Female Mink Exposed to Aroclor 1254 for 1 Breeding Season (Aulerich77 - Aulerich and Ringer 1977; Kihistrm92 - Kihiström, et al. 1992; Wren87 - Wren, et al. 1987)

Following a suggestion of CBS (then Viacom), an uncertainty analysis has been performed for the two sets of meta-analysis TRVs. The procedure, recommended by Dr. John Giesy, ENTRIX, consultant to CBS, is to remove data points individually from the combined data set to assess the effect of incompatibilities between studies and treatments on the TRV interpolation. The results show that the TRVs for PCB dietary exposure to mink, and PCB ingestion dose to birds, are robust to data variability in the upper range of exposures, but not in the lower range of exposures. In other words, the "actual" TRVs are unlikely to be higher than the values used in the FERA–the analysis recommended by CBS resulted in no more than a 20 % increase in the calculated TRVs, and mostly less than 10 % changes related to variability in the upper range of exposures, but the "actual" TRVs might be lower than derived for the FERA–the procedure resulted in 35 to 90 % decreases in calculated TRVs related to variability in the lower range of exposures. This implies that risk calculations based on these TRVs are unlikely to overestimate risk, but the possibility that risk might be underestimated cannot be ruled out.

TRVs derived from what CBS characterizes as "relevant single high value studies" are presented in Appendix E of the FERA, and comparisons with the TRVs used in the FERA are discussed in FERA Sections 4.1 and 4.2. The FERA meta-analysis TRVs are consistent with, or *less* conservative than the peer-reviewed mink PCB TRVs used for the Fox River Superfund Site, the Hudson River Superfund Site, or the Great Lakes Initiative (used to establish water quality criteria for the Great Lakes). The discussion is expanded below:

Two high-profile applications of mink total PCB TRVs in USEPA Region 5 have been for the Great Lakes Initiative (GLI) and the Fox River Superfund site in Wisconsin. The TRVs were based on "relevant single high value studies", and were externally peer reviewed in both cases. Converted to a dietary basis, the Fox River mink LOAEC (0.5 to 0.7 mg PCB/kg diet) is highly consistent with the LOAEC of 0.6 mg PCB/kg diet in the FERA. The NOAEC for the Fox River (0.25 mg PCB/kg diet), is lower (more conservative) than the FERA NOAEC of 0.5 mg PCB/kg diet. The LOAEC for the GLI (2.0 mg PCB/kg diet) is higher than the FERA LOAEC, but is based on complete reproductive suppression in mink, which is inadequately protective for regulatory purposes (the GLI water quality criteria are based solely on no effect levels, and the LOAEC served only as a starting point for estimating a NOAEC). Again, the GLI NOAEC (0.2 mg PCB/kg diet) is more conservative than the FERA NOAEC. The low NOAEC values chosen for the Fox River and GLI are the result of wide dose spacing in individual experiments that missed the actual dose at which adverse effects begin to be observed. By combining multiple studies, the meta-analysis in the FERA provides a more detailed characterization of the relationship between exposure and reproductive effects compared to single-study approaches.

Outside of USEPA Region 5, the externally peer-reviewed mink TRVs for the Hudson River are much more conservative (LOAEC – 0.25 and NOAEC – 0.025 mg PCB/kg diet) than the mink TRVs in the FERA. A site-specific mink feeding study was performed for the Housatonic River Superfund site (Bursian, et al. 2006). The dietary concentration of the treatment resulting in decreased kit survival (3.7 mg PCB/kg diet) is higher than the LOAEC TRVs used at other Superfund sites, but resulted in high kit mortality (54 %). The investigators performed probit regression analysis to calculate the dietary concentrations lethal to 20 % and 10 % of kits (LC_{20} and LC_{10}, respectively) and the associated 95 % confidence intervals (CI). The LC_{20} is 1 mg PCB/kg diet (CI: 0.5 – 1.9 mg/kg), and the LC_{10} is 0.2 mg PCB/kg diet (CI: 0.03 – 0.5 mg/kg) (Bursian, et al. 2006). The Bursian, et al. (2006) LC_{20} differs from the FERA LOAEC by less than a factor of 2, reasonably consistent with the observed difference in toxicity between PCB exposure over 1 breeding season versus exposure over 2 breeding seasons. In contrast, the Bursian, et al. (2006) LC_{10} is lower (more conservative) than the FERA NOAEC. However, the 95 % confidence intervals for the Bursian, et al. (2006) LC_{20} and LC_{10} include the values of the LOAEC (0.6 mg PCB/kg diet) and NOAEC (0.5 mg/kg) TRVs, respectively, used in the FERA.

Overall, the FERA mink PCB NOAEC is less conservative than the NOAECs based on "relevant single high value studies" at other sites. The estimated risk to mink would be much higher if the FERA NOAEC TRV were replaced with the externally peer-reviewed NOAEC TRVs for the Fox River Superfund site, the Hudson River Superfund site, or the Great Lakes Initiative, or with the LC_{10} of the Housatonic River study.

Overall, the FERA mink PCB LOAEC is a median value among the LOAECs based on "relevant single high value studies" at other sites. The estimated risk to mink would increase more than 2-fold if the FERA LOAEC TRV were replaced with the externally peer-reviewed LOAEC TRV from the Hudson River site, the risk estimate would not change if the externally peer-reviewed Fox River LOAEC TRV were used, and about 40 % less risk would be estimated based on the LC_{20} of the Housatonic River study with no adjustment for exposure duration.

Two high-profile applications of avian total PCB TRVs in USEPA Region 5 have been for the Great Lakes Initiative (GLI) and the Fox River Superfund site in Wisconsin. The TRVs were externally peer reviewed in both cases. The GLI LOAEL (0.6 mg PCB/kg_{BW}-d), based on a study with pheasant, is similar to the FERA LOAEL (0.5 mg/kg_{BW}-d), but the GLI NOAEL (0.2 mg/kg_{BW}-d) is lower (more conservative) than the FERA NOAEL (0.4 mg/kg_{BW}-d). The Fox River LOAEL (1.12 mg/kg_{BW}-d), based on effects in doves, is higher than the FERA LOAEL, but the Fox River NOAEL (0.11 mg/kg_{BW}-d) is much lower than the FERA NOAEL. The Fox River avian TRVs are incorporated into the FERA in addition to the meta-analysis TRVs to provide a range of risk estimates for kingfisher to account for unknown sensitivity to PCBs.

The TRVs for kingfisher at the Hudson River Superfund site (LOAEL – 7.1 and NOAEL – 1.8 mg PCB/kg_{BW}-d) are much higher than the TRVs for the FERA, Fox River, or GLI. The Hudson River TRVs are based on the same pheasant study used by the GLI, but a different and less sensitive endpoint was used for the Hudson River (egg production) than for the GLI (egg hatchability). Use of egg production for setting PCB TRVs is questionable for two reasons: first, egg production in chicken, a sensitive species to PCBs, shows no coherent relationship with PCB exposure (Figure 3), and second, there is "very little evidence" that egg production limits clutch size in the field (Mineau 2005). The GLI use of egg hatchability, not egg production, is a more ecologically relevant basis for deriving TRVs.

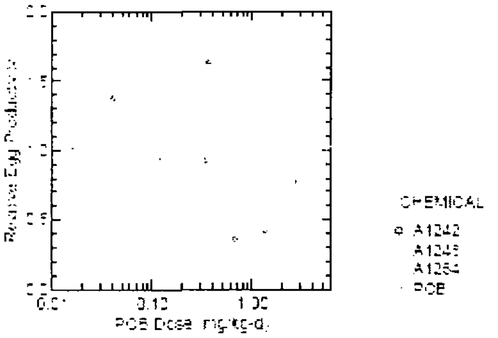

Figure 3. Egg Productivity, PCB Dose to Chicken Hens
(Sources: Britton and Huston 1973; Cecil, et al. 1974; Lillie, et al. 1974; Platanow and Reinhart 1973; Scott 1977; and Summer, et al. 1996a,b)

Second bullet:

The mink PCB TRVs in the FERA are based on mink feeding studies performed over a single breeding season (longer duration Aroclor feeding studies with mink were not located). Prolonged mink feeding studies with field-contaminated fish (Restum, et al. 1998) or with a European PCB product (Brunström, et al. 2001) have shown increased toxicity after continuous exposure through 2 breeding seasons or to 2 generations of mink. The TRVs based on single-breeding season exposure to Aroclor 1254 are accordingly adjusted to reflect the increased toxicity with longer exposure as seen in other mink studies. The findings of increased PCB toxicity with prolonged exposure over more than one breeding season or generation in two mink feeding studies are supported by similar findings in PCB studies with other mammals:

McCoy, et al. (1995) reported the PCB body burden in oldfield mice (*Peromyscus polionotus*) approximately doubled between generations at a constant exposure concentration, and was associated with increasingly adverse effects.

> "These observations indicate that, even at this low level, chronic exposure to PCBs has pronounced reproductive effects on mammals and that these effects are amplified through multigeneration exposure. ... It is apparent that continued exposure at a low level results in amplified body burdens over three generations. For wild populations that remain in the same area for many generations, cumulative effects may have serious consequences. ... In studies of wild populations, it is evident that the roles of maternal exposure and increasing body burdens must be considered in assessing the long term effects of PCB exposure."

Linzey (1988) reported for white-footed mice (*Peromyscus leucopus*) that

> "Reproductive success of second generation PCBs-treated white-footed mice was reduced in comparison with performance of the parental generation reported by Linzey (1987). ... These results confirm the expectation that effects of chronic exposure to PCBs are cumulative through generations, probably due to length of exposure as well as to exposure during critical periods of growth and development."

The PCB studies are consistent with an increase in the reproductive toxicity of dioxin (TCDD) associated with exposure to multiple generations of rats compared to exposure to a single generation (f_0 is the initial generation tested, f_1 is the offspring from f_0, and f_2 is the offspring from f_1) (Murray, et al. 1979).

> "At the intermediate dose of 0.01 μg TCDD/kg/day, many adverse effects seen in the f_1 and f_2 adults and their litters were not evident in the f_0 adults or their offspring. The most obvious difference is that the f_0 rats were given TCDD beginning at about 7 weeks of age whereas subsequent generations were exposed to TCDD, at least theoretically, from the time of conception. This suggests that some of the effects observed were initiated, perhaps, during the neonatal period."

CBS's comments on the Brunström, et al. (2001) study are inaccurate. Brunström, et al. (2001) evaluated three doses (control, A50 low, and A50 high), not two doses as asserted by CBS. Brunström, et al. (2001) also reported multiple endpoints including percent mated females whelping, total litter size, live litter size, kit birth weight, and kit organ weight for both 6- and 18-month exposure durations for all three doses. This means that potentially 20 different TRVs could be derived from the study (5 endpoints * 2 PCB exposure durations * 2 TRV categories [NOAEC or LOAEC]). CBS correctly points out that 2-week survival of kits per mated female is only reported for 18-month exposure, and therefore cannot be compared to 2-week kit survival for 6-month exposure; however, the difference between the toxicity of PCB exposure over 6 versus 18 months is not based on 2-week kit survival. Instead, it is based on live kits at birth per mated female, which is readily calculated from the data presented in Tables 3 (6-month) and 5 (18-month) of Brunström, et al. (2001) [live kits per mated female = % mated females whelping * live litter size]. The number of live kits per mated female in the A50 high treatment dropped from 3.4 live kits/mated female with 6-months PCB exposure to only 0.8 live kits/mated female with 18-months exposure.

CBS's comments on the Restum, et al. (1998) study conflates the methodology for statistically deriving TRVs with the methodology for interpolation of TRVs from dose-response curves. Statistically significant differences are not prerequisites for including treatments in dose-response plots – to the contrary, *all* treatment results should be included in dose-response plots to understand how toxicity changes with exposure. Figure 4 illustrates the dramatic effect of exposure duration on live kits per mated female mink in the Restum, et al. (1998) study.

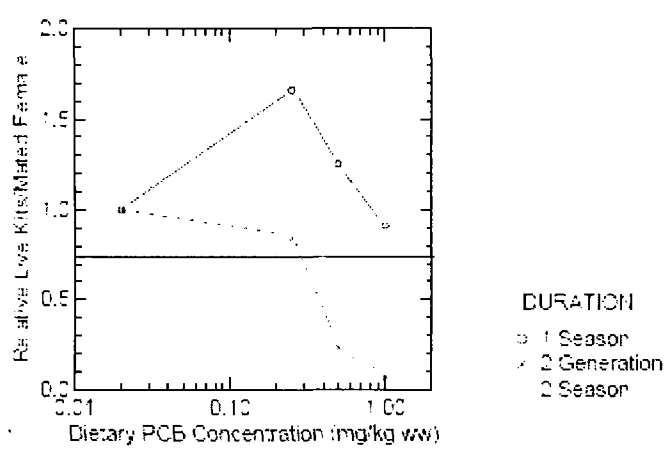

Figure 4. Live Kits per Mated Female Mink Exposed to Field-contaminated Fish for Single and Multiple Breeding Seasons or Generations (Restum, et al. 1998)

The increasingly adverse effects of PCB exposure over 2 breeding seasons or 2 generations compared to exposure over a single breeding season in the Restum, et al. (1998) study are not "artifacts of the interpolation method", but are supported by the statistical analyses presented in the study. The LOAEC for kit survivability with only a single breeding season exposure is 1 ppm PCB, whether assessed at birth, 3 weeks, or 6 weeks after birth. In contrast, with continuous exposure over 2 breeding seasons, the LOAEC for kit survivability is 0.5 ppm at 3 and 6 weeks after birth. Similarly, with continuous expose over 2 generations of mink, the LOAEC for kit survivability is 0.5 ppm at birth, 3 weeks, or 6 weeks after birth (Table 7 in Restum, et al. 1998). In other words, there is a 2-fold decrease in the LOAEC for kit survivability when PCB exposure is increased from a single breeding season to 2 breeding seasons or 2 generations.

Third bullet:

The mink feeding study performed for the Housatonic River Superfund site is a high quality single-breeding season exposure study, but the applicability to the Lemon Lane Landfill site is uncertain because of the differences in the major Aroclors released at each site. The predominant Aroclor released to the Housatonic River was Aroclor 1260 (USACE/USEPA 2004), reflected in both Housatonic River aquatic biota (Yanik, et al. 2003) and tree swallows (Custer and Read 2006).

Aroclor 1260 differs in composition and toxicity from Aroclor 1242, the predominant Aroclor disposed in Bennett's Dump. The dioxin-like toxicity of Aroclor 1260 is less than one-half of that of Aroclor 1242, as shown by bioassays that provide an integrated measure of total dioxin-like activity (Tillitt, et al. 1992). Aroclor 1260 differs in having a larger polychlorinated dibenzofuran (PCDF) co-contaminant component compared to other Aroclors—12 times as much as Aroclor 1242 (Wakimoto, et al. 1988). Most of the TEQ of Aroclor 1260 is due to PCDFs (70 %), not PCB coplanar congeners (29 %), in contrast to Aroclors 1248 and 1254 in which most of the TEQs are due to PCB coplanar congeners (at least 90 %) with only small PCDF contributions (less than 10 %) (Yamashita, et al. 2000). The predominant role of PCDFs in causing toxicity at the Housatonic River site is supported by a field study of tree swallows:

> "The hypothesis that the dioxin and furan congeners are contributing to reduced hatching success *more so* than the PCB congeners is further supported by the two-variable model results. In these models, TEQs associated with PCBs become nonsignificant in both analyses, while the WHO TEQs for dioxin/furans remained as a significant variable ..." (Custer, et al. 2003) [emphasis added].

PCDFs also bioaccumulate less overall compared to PCB coplanar congeners. The reported biota-sediment accumulations factors (BSAFs) in field studies are lower for PCDFs than for PCBs (Niimi 1996; van der Oost, et al. 1996; Marvin, et al. 2002; Naito, et al. 2003; Burkhard, et al. 2004). Similarly, diet-to-egg biomagnification factors (BMFs) for birds are lower overall for PCDFs compared to PCB coplanar congeners (Hoffman, et al. 1996; Henny, et al. 2003; Murata, et al. 2003).

Despite the differences in composition and bioaccumulation between the predominant Aroclors released at the sites, the ratios of TEQ to total PCBs in fish samples appear to be similar for fish from the Housatonic River and Clear Creek. However, total PCBs are measured differently at the two locations: sum of PCB congeners for Housatonic River fish and total Aroclor for Clear Creek fish. Aroclor analysis may overestimate or underestimate total PCBs compared to the sum of congeners (Sather, et al. 2003; Connor, et al. 2005). For Clear Creek fish, the magnitude of the difference between Aroclor-based and congener-based analysis of total PCBs is uncertain, so there is significant uncertainty over the comparison with the data on Housatonic River fish. TEQ is also measured differently at the two sites, for Clear Creek samples it includes only dioxin-like PCB congeners, but for the Housatonic River samples, TEQ also includes the contributions of dioxins and chlorinated dibenzofurans.

Fourth bullet:

Chicken are known to be sensitive to PCBs, and chicken PCB toxicity data are used to derive one set of TRVs to represent higher sensitivity to PCBs, but a second set of TRVs based on doves is also used in the FERA to represent middle sensitivity to PCBs, which brackets uncertainty over the sensitivity of kingfisher to PCBs. It would be inappropriate to solely assess potential risk to kingfisher based only on TRVs for insensitive species when the sensitivity of kingfisher is uncertain.

Data from a dioxin study with pheasant is used for dose-based TEQ TRVs. Although pheasant are also a gallinaceous species, pheasant is less sensitive to dioxin than chicken. One of CBS's consultants described pheasant as "one of the more tolerant species" to dioxin-like effects (Giesy, et al. 1995; see also Bowerman, et al. 1995).

The kingfisher field study performed at the Housatonic River site is limited by several shortcomings in design, including an insufficiently broad exposure gradient, lack of a control or reference population, and a method of evaluation that is subject to confounding because the results of the field study are compared to that of a single study from the literature for a different location. According to the Housatonic River ERA (USACE/USEPA 2003 §8.5.4):

> "The belted kingfisher field study results do not definitively support the conclusions of low risk because the data are limited. There are several conclusions drawn by the authors that are not strongly supported by the information presented in the report. The conclusion that the kingfisher population is consistent with the quality of habitat present is speculative. ... It is inappropriate to conclude that the Housatonic River kingfishers fall within the range reported for other kingfisher populations when only one study is referenced."
>
> "... EPA was not provided with an opportunity to review these protocols prior to receiving the study. There were several shortcomings of the approach used. For example, there was no reference site, no information was provided regarding nest search intensity, the researchers were unable to determine clutch size, and there were too few visits to the nests during the reproductive cycle. These shortcomings limit the ability to draw rigorous conclusions."
>
> "The approach used to estimate dose in the belted kingfisher study had a number of shortcomings. ... As a result, the dose gradient achieved by this approach is likely too narrow to detect a significant dose-response relationship."
>
> "The sample sizes were very small (i.e., n=6) for the statistics used ..."

For these reasons, the Housatonic kingfisher field study is not considered an adequate study for reducing uncertainty over the relative sensitivity of kingfisher to PCBs.

Fifth bullet:

With the exception of the Housatonic kingfisher field study (addressed in the previous comment), the examples in the comment are based on dioxin-like effects in raptors. Assuming kingfisher sensitivity to PCBs is similar to that of raptors is as uncertain as assuming it is similar to that of chicken because kingfisher is not a close relative of either chicken or raptors. The FERA assesses risk to kingfisher based on a range of sensitivities to address this uncertainty.

In a review of avian studies of dioxin-like toxicity performed by USEPA, chicken was not shown to be unusually sensitive:

> "A conclusion of these analyses is that the domestic chicken is, as is generally recognized, the most sensitive tested species, but it is not aberrantly sensitive. Given the wide range of sensitivities within birds and within mammals to dioxin-like chemicals, test data for chickens should be used." (USEPA 2003).

The review also compared TRVs derived through the species sensitivity distribution (SSD) approach for laboratory versus field studies. The egg TEQ TRVs are lower (showing greater toxicity) based on field studies compared to TRVs based on laboratory studies, even when chicken are included in the laboratory SSD (USEPA 2003). This indicates that the results of chicken studies are not necessarily overprotective for wild birds, and may even be underprotective in some situations.

Sixth bullet:

The particular values of the egg TEQ TRVs used in the FERA are based on enzyme induction, but the TRVs were chosen because they represent a middle range between the values reported in multiple field studies of piscivorous birds that resulted in reproductive impacts, which are ecologically relevant endpoints.

Seventh bullet:

CBS (then Viacom) was offered the opportunity to perform ecological risk assessments for the Bloomington sites but declined. The selection of kingfisher as an assessment endpoint is based on sightings of kingfisher along Bloomington streams, and because their territorial behavior means they are potentially highly exposed receptors.

Comment 82: EPA has assumed that the PCBs in Clear Creek fish, even those at the most distant two stations (Fluckmill and Strainridge Roads), are directly related to and largely driven by PCBs which bypass the treatment system at Illinois Central Spring. While it is true the PCBs which bypass the treatment plant do eventually enter Clear Creek, the assumption that those PCBs are largely responsible for most of the PCBs in the fish of the main stem of Clear Creek (at stations 2,3 and 4) is un-proven and most of the evidence suggests it is unlikely. For example:

First bullet:

Refer to Figure 1. This Figure shows the calculated hazard quotients for mink at each of the 4 stations for all sampling events since 1996 using EPA's methods (EPA NOEAL TRV and CTE PCB levels). There were two sets of fish data taken prior to construction of the ICS treatment plant in 2000. The data clearly shows that while the 1996 hazard quotients are higher than post 2000 levels, the 1999 hazard quotients for fish at stations 2, 3 and 4 are essentially the same as those after completion of the treatment plant. This would indicate that the PCBs in the fish of the main stem of Clear Creek have not changed substantially from the 1999 levels. Since the ICS treatment plant, in its current configuration captures the vast majority of PCBs issuing from ICS this indicates that most of the PCBs in the fish of the main stem of Clear Creek are not driven by PCBs which issue from ICS or currently bypass treatment. Put another way, the source control measures at Lemon Lane Landfill and the treatment of water at ICS have had no significant impact on risk levels in the main stem of Clear Creek when compared to 1999 levels.

Second bullet:

Additionally, note that the calculated hazard quotients do not change much as you get farther from the assumed source at ICS. In fact the calculated hazard quotients for station 4 (20 miles downstream from ICS) are higher than for stations 2 and 3 (station 2 is only a few miles from ICS) and essentially equal to station 1 (which is within 2 miles from the ICS). EPA has noted this apparent discrepancy and explained it by looking at the difference between sizes and types of fish sampled at the various locations (USEPA 2006). However, the effective dilution between station 1 and station 4 is huge. For example, see Table 2. This table shows the flow estimates at various points along the creek. The flow was estimated at about 100 gpm near station 1. While upstream of station 4 (at Ketcham Rd on the table) the flow was almost 9000 gpm. Since there are other significant tributaries which enter Clear Creek between Ketcham Rd and Strainridge Rd (station 4), the flow at station 4 surely is greater than 9000 gpm. This implies an effective dilution ratio of more than 90 to 1 (and likely closer to 100 to 1) between station 1 and 4. This implies that PCBs which currently bypass treatment at ICS would be substantially diluted prior to reaching station 4 and only a minor source to fish at station 4. This dilution effect is seen in other stream systems around Bloomington. For example, PCB levels in the main stem of Richland Creek fish drop off dramatically as you get more than a few miles from Neal's Landfill (the only known source of PCBs to Richland Creek) due to dilution even though the fish at further downstream locations are in some cases larger than those sampled much closer to the site (see USEPA 2001) and the same effect is seen in Stout's Creek near Bennett's Dump. In most creek systems, PCB levels in fish will drop as you get farther downstream from a source due to dilution effects. The fact that this does not happen in Clear Creek indicates that the PCBs which bypass treatment at ICS are not a controlling source to fish more than a few miles downstream.
Third bullet:

A more likely scenario, based on the evidence and the nature of Clear Creek, is that the PCBs in fish of the small branch which directly receives the ICS discharge (represented by the Allen St location) are directly related to discharges from Illinois Central Spring. But as the water from this branch enters the main stem of Clear Creek, significant dilution occurs and the loading to fish from the ICS source is significantly diminished. The farther down Clear Creek you travel, the additional dilution will further diminish the impact of the ICS source on fish. This is especially true beyond several major tributaries such as Jackson Creek, the Dillman Road treatment plant and the Shirley/Leonard Springs Branches. The PCBs in fish downstream of these major tributaries are more likely a result of other potential sources. The ICS PCBs would be less of a factor at these locations for several reasons. First, they are significantly diluted. But secondly, and most importantly, the ICS PCBs which bypass treatment occur in very short burst during very large storm events. These are relatively rare and very short lived events. These PCBs are released for short time periods during major storm flows when flows throughout Clear Creek are high, which yields large dilution and little opportunity for settling.

Response: First bullet:

The analysis and figure presented in CBS's comments are not appropriate approaches for assessing temporal trends in PCB exposures to mink feeding on Clear Creek fish because of inconsistencies in the species composition of the fish samples used to model mink dietary exposures between sampling events. For example, the mink risk estimates at Station 4 are based on a mix of green sunfish and hog suckers in 1996; longear sunfish, stonerollers, rock bass, bluegill, and hog suckers in 1999; longear sunfish, hog suckers, and redhorse in 2000; longear sunfish and rock bass in 2002; and longear sunfish and redhorse in 2004. Different species of fish accumulate PCBs differently depending on species-specific diet (trophic status), metabolism (elimination of PCBs), foraging behavior (amount of sediment contact), movement (duration of exposure where collected), and lipid content (higher lipid content is normally associated with higher whole-body PCB concentration). The temporal trends in modeled mink dietary PCB exposure are confounded by the shifts in fish species sampled between years, by changes in fish lipid contents among species and between sample years, and by apparent movement of small numbers of fish between sample locations shortly before collection (data outliers).

Temporal changes in fish PCB uptake should be assessed on a species-specific basis. For the Clear Creek whole-fish samples collected between 1996 and 2004, species-specific data are available for multiple years at the same location for creek chubs, green sunfish, and longear sunfish (Table 1). To minimize the influence of changes in lipid content between samples, the whole-fish PCB concentrations of each individual sample are lipid-normalized (lipid-normalized PCB = whole fish PCB / (% fish lipid content / 100)). Samples with no reported lipid data are excluded from the analysis because lipid-normalized PCB concentration cannot be calculated. To minimize the influence of possible data outliers, the geometric mean lipid-normalized PCB is calculated instead of an arithmetic mean (geometric means are less influenced by extreme values compared to arithmetic means).

All of the species-location examples with 1996 data show decreased lipid-normalized PCB accumulation in fish in 2004 compared to 1996 (creek chub in Stations 1 or 2, and green sunfish in Stations 2 or 3). Most of the examples with 1999 data also show decreased lipid-normalized PCB accumulation in fish in 2004 compared to 1999 (creek chub in Station 3, and longear sunfish in Station 4). An exception is creek chub in Station 2, which show higher lipid-normalized PCB accumulation in 2004 compared to 1999 (but much lower accumulation compared to 1996). Overall, these data do not support CBS's claim that the water treatment plant has had no effect on the main stem of Clear Creek.

Table 1. Temporal Trends in Geometric Mean PCB Concentration and Arithmetic Mean Lipid Content by Species and Sampling Station, Whole-fish Samples Collected from Clear Creek Downstream of Lemon Lane Landfill, Bloomington, IN.

Station	Species	Date	N	Whole-body PCB Conc.	Lipid Content	Lipid-normalized PCB Conc.
				mg/kg	%	mg/kg lipid
1	creek chub	11/96	9	17.6	2.2	835
		11/02	11	6.7	0.7	1093
		11/04	7	1.6	1.6	104
2	creek chub	11/96	8	1.8	1.2	151
		11/99	4	0.6	1.4	49
		11/00	4	1.5	1.5	115
		11/02	6	0.7	0.7	111
		11/04	6	1.0	1.1	88
2	green sunfish	11/96	9	3.2	3.3	100
		11/02	5	1.3	1.3	165
		11/04	6	1.8	2.7	66
3	creek chub	11/99	2	1.0	0.9	112
		11/00	3	0.4	1.5	30
		11/02	5	0.5	0.5	105
		11/04	7	1.0	1.5	68
3	green sunfish	11/96	8	1.0	1.0	110
		11/02	6	1.2	1.2	108
		11/04	6	1.6	2.7	68
4	green sunfish	11/96	8	4.0	3.4	131
	longear sunfish	11/99	4	2.8	2.4	117
		11/00	5	1.4	3.8	40
		11/02	6	1.8	1.3	165
		11/04	6	1.7	4.4	41

Fish Sample Stations: 1 – Allen St, 2 – Country Club Rd, 3 – Fluckmill Rd, 4 – Strainridge Rd

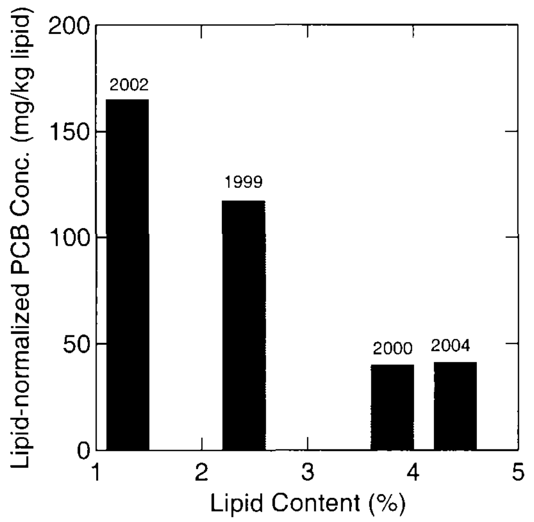

Figure 5. Arithmetic Mean Lipid Content and Geometric Mean Lipid-normalized PCB Concentration in Longear Sunfish Collected in November from Sample Station 4 (Strainridge Road), Clear Creek, Lemon Lane Landfill Site, Bloomington, IN.

An unusual pattern in the data is an inverse relation between mean lipid content and lipid-normalized PCB concentration in the same species at a single location but collected in different years. This pattern is most apparent in the lower reaches of Clear Creek, for example, longear sunfish in Station 4 (Figure 5) and green sunfish or creek chub in Station 3 (Table 1). A possible explanation for this pattern is redistribution of accumulated PCBs to dwindling lipid reserves in stressed fish, as has been reported in fasting animals (Lydersen, et al. 2002; Debier, et al. 2006; Fuglei, et al. 2006). Sampling for the Neal's Landfill site shows markedly deceased fish lipid contents in November compared to May or August. If a similar seasonal pattern holds for Clear Creek fish, in years in which fish use large portions of their lipid reserves late in the season, the November lipid-normalized PCB concentrations would be elevated compared to less stressful years in which the fish maintain higher lipid reserves and therefore do not internally redistribute previously absorbed PCBs.

Regardless of the explanation, the inverse lipid content – lipid-normalized PCB concentration relationship further complicates evaluation of temporal trends in fish PCBs in Clear Creek. One way to minimize this effect is to compare lipid-normalized PCB concentrations when the mean lipid contents are similar between sample dates. Two of three comparisons indicate decreased PCB exposure. Decreases in lipid-normalized PCB concentrations at similar lipid contents occur in Station 2 creek chub (1996 – 2004) and

Station 4 sunfish (1996 green sunfish – 2000 longear sunfish), but not in Station 3 green sunfish (1996 – 2002) (Table 1).

Second bullet:

For the same reasons discussed in the previous response, spatial trends in PCBs should be assessed on a species-specific basis. The available data are summarized in Table 2. Green and longear sunfish are closely related, so close they are known to hybridize, therefore their data are combined in two cases to expand the available comparisons. Five of the eight comparisons show decreasing lipid-normalized PCB concentrations in fish with distance from Lemon Lane Landfill (creek chub in 1996, 2000, 2002, and 2004; and green sunfish/longear sunfish in 2004). Three of the eight comparisons do not show decreasing trends (green sunfish in 1996; creek chub in 1999; and green sunfish/longear sunfish in 2002) (Table 2).

The increase in modeled risk to mink at Station 4 compared to upstream stations is a result of differences in the species of fish collected at different stations and differences in fish lipid contents between stations. The evidence that the increase in risk at Station 4 is not due to an addition PCB source is shown by the relationship between lipid content and total PCBs in fish samples of the same or closely related species (Figures 6 – 8). For the most recent sampling events, 2002 and 2004, data for green sunfish in Station 3 are compared to longear sunfish in Station 4. In 2002, the Station 4 longear sunfish show the same relationship between lipid content and total PCB as Station 3 green sunfish, with a single outlier that probably represents a fish that recently moved from a more highly exposed upstream reach of Clear Creek (Figure 7). There is a strong linear relationship between lipid content and total PCB concentration for the combined data from both stations in 2002, excluding the single longear sunfish outlier ($N = 11$, adjusted $r^2 = 0.83$, $p < 0.001$). The similarity of the lipid content – total PCB relationship in Stations 3 and 4 is not an artifact of comparing related species, because green sunfish in Station 3, Station 4, and an intermediate Ketchum Road station in 1996 also exhibit a strong linear relationship between lipid content and total PCB concentration (Figure 8) ($N = 21$, adjusted $r^2 = 0.74$, $p < 0.001$) (the statistical results are the same when the additional longear sunfish data are included). In 2004, Station 4 longear sunfish exhibit much *less* PCB accumulation for the range of lipid contents compared to Station 3 green sunfish (Figure 6). These analyses demonstrate that the increase in modeled risk to mink at Station 4 is not a result of a significant additional downstream point source of PCBs.

PCB levels in fish do not decrease as rapidly in Clear Creek with distance as, for example, in Richland Creek, but this does not necessarily mean that there are additional downstream external sources of PCBs to Clear Creek It may also result from slower natural attenuation processes in Clear Creek compared to Richland or Stout's Creeks, or greater potential for remobilization of sediment PCBs compared to other the other creeks.

Table 2. Spatial Trends in Geometric Mean PCB Concentration and Arithmetic Mean Lipid Content by Species and Sampling Station, Whole-fish Samples Collected from Clear Creek Downstream of Lemon Lane Landfill, Bloomington, IN.

Date	Species	Station	N	Whole-body PCB Conc.	Lipid Content	Lipid-normalized PCB Conc.
				mg/kg	%	mg/kg lipid
11/96	creek chub	1	9	17.6	2.2	835
		2	8	1.8	1.2	151
		K	2	0.5	1.0	55
11/96	green sunfish	2	9	3.2	3.3	100
		3	8	1.0	1.0	110
		K	5	2.1	2.4	93
		4	8	4.0	3.4	131
11/99	creek chub	2	4	0.6	1.4	49
		3	2	1.0	0.9	112
11/00	creek chub	2	4	1.5	1.5	115
		3	3	0.4	1.5	30
11/02	creek chub	1	11	6.7	0.7	1093
		2	6	0.7	0.7	111
		3	5	0.5	0.5	105
11/02	green sunfish	2	5	1.3	1.3	165
		3	6	1.2	1.2	108
	longear sunfish	4	6	1.8	1.3	165
11/04	creek chub	1	7	1.6	1.6	104
		2	6	1.0	1.1	88
		3	7	1.0	1.5	68
11/04	green sunfish	2	6	1.8	2.7	66
		3	6	1.6	2.7	68
	longear sunfish	4	6	1.7	4.4	41

Fish Sample Stations: 1 – Allen St, 2 – Country Club Rd, 3 – Fluckmill Rd, K – Ketchum Rd, 4 – Strainridge Rd

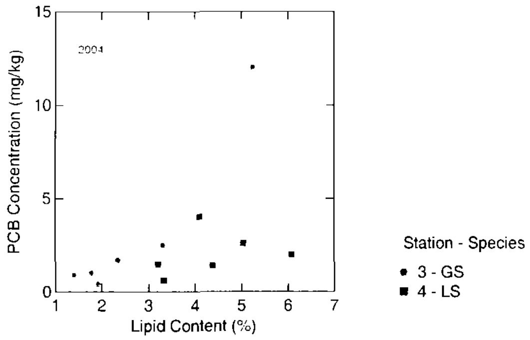

Figure 6. Total PCBs and Lipids (whole-fish wet weight) in Green and Longear Sunfish, Fluckmill (3) and Strainridge (4) Roads, Clear Creek, Bloomington, IN, November 2004.

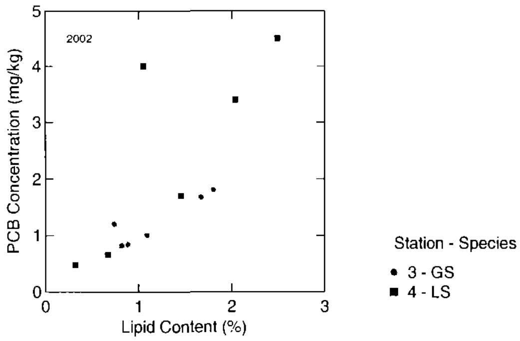

Figure 7. Total PCBs and Lipids (whole-fish wet weight) in Green and Longear Sunfish, Fluckmill (3) and Strainridge (4) Roads, Clear Creek, Bloomington, IN, November 2002.

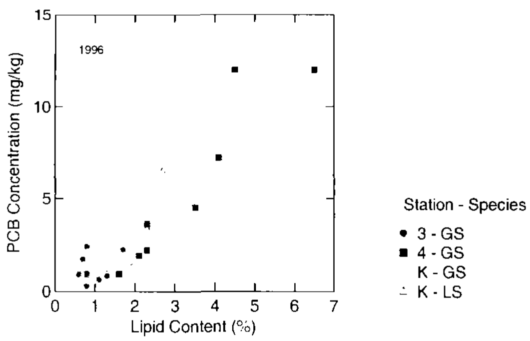

Figure 8. Total PCBs and Lipids (whole-fish wet weight) in Green (GS) and Longear (LS) Sunfish, Fluckmill (3), Ketchum (K), and Strainridge (4) Roads, Clear Creek, Bloomington, IN, November 1996.

Third bullet:

Uncontrolled releases of large amounts of PCBs from the Lemon Lane Landfill occur during storm events that greatly exceed Ambient Water Quality Criteria. Controlling these releases is a necessary component in allowing Clear Creek to recover over time.

Comment 83: The World Health Organization (WHO) has recently re-issued its recommended mammalian TEFs for PCBs (WHO 2005). While some of the revised TEFs went up and some went down, when you apply the revised TEFs for the Clear Creek fish significantly less TEQs are calculated (see Table 1). The new TEFs should be used for the assessment of risk in the Lemon Lane risk assessment.

Response: Risk estimates *increase* in the two Clear Creek sample locations closest to the Lemon Lane Landfill when the mammalian WHO_{1998} TEFs used in the FERA are replaced with the revised WHO_{2005} TEFs. Application of the WHO_{2005} TEFs to the 2004 Clear Creek fish congener data results in lower fish TEQs, decreased by 41 % compared to TEQ based on WHO_{1998} TEFs (range of -28 to -60 % per sample), with correspondingly decreased mink dietary exposures (-40 %, range -30 to -60 %), but the overall effect on risk also depends on recalculation of the TEQ TRVs with the revised TEFs. The mink TEQ TRVs used in the FERA are based on the geometric mean of the TRVs in two long-term mink studies (Restum, et al. 1998; Brunström, et al 2001). The congener data for the Restum, et al. (1998) study are reported in Tillitt, et al. (1996). The WHO_{2005} TEQs of the three exposure treatments in Restum, et al. (1998) are 24 % lower than the WHO_{1998} TEQs (range -23 to -24 %), and the WHO_{2005} TEQs of the two exposure treatments in Brunström, et al. (2001) are 53 % lower than the WHO_{1998} TEQs (range -52 to -53 %). The revised mink dietary WHO_{2005} TEQ NOAEC is 2.8 pg/g (compared to 4.6 pg/g WHO_{1998} TEQ), and the LOAEC is 11. pg/g (compared to 18 pg/g WHO_{1998} TEQ). The revised exposure and risk estimates are shown in Table 3.

Table 3. Mean WHO_{2005} TEQ Concentration in Fish and in Mink Diet, and the Associated Mink Risk Estimates, Compared with WHO_{1998} TEQ Risk Estimates, November 2004 Fish Data, Lemon Lane Landfill, Bloomington, IN

Station	WHO_{2005} TEQ		HQ NOAEC	HQ LOAEC	HQ NOAEC	HQ LOAEC
	Fish	Mink Diet	(WHO_{2005})	(WHO_{2005})	(WHO_{1998})	(WHO_{1998})
	pg/g	pg/g	ratio	ratio	ratio	ratio
1	77.7	61.4	21.9	5.6	19.0	4.9
2	18.3	14.5	5.2	1.3	4.5	1.2
3	12.8	10.1	3.6	0.9	3.5	0.9
4	10.0	7.9	2.8	0.7	4.3	1.1

WHO_{2005} TEQ TRVs: NOAEC – 2.8 pg/g; LOAEC – 11 pg/g (Restum, et al. 1998; Brunström, et al 2001)
HQ (WHO_{1998}) as reported in FERA Table E-4
WHO_{1998} TEQ TRVs: NOAEC – 4.6 pg/g; LOAEC – 18 pg/g (Restum, et al. 1998; Brunström, et al 2001)

The estimated risks to mink are higher in Clear Creek sampling stations 1 and 2 (Allen Street and Country Club Road) based on WHO_{2005} TEQs as compared to risks based on WHO_{1998} TEQs. The risks are similar in Station 3 (Fluckmill Road) on either basis. Risks are lower in Station 4 (Strainridge Road) based on WHO_{2005} TEQs compared to risks based on WHO_{1998} TEQs. Interestingly, the apparent downstream increase in mink risk based on WHO_{1998} TEQs does not occur with the revised WHO_{2005} TEQs.

Comment 84: Clear Creek at the most upstream station, represented by Allen Street, is a very shallow stream in a highly urbanized area. Since kingfishers are dive feeding birds and the water is so shallow, it is unlikely that kingfishers would use this stream reach extensively. A more appropriate avian receptor for this shallow habitat is a great blue heron. Additionally, there is some direct toxicity data for great blue herons and PCB (see Viacom 2004). Therefore use of this receptor at this location would reduce the uncertainty in the avian risk estimate. CBS has shown a representative risk assessment for great blue herons at the NLF site and thus has developed appropriate factors (feeding range, ingestion rates, body weight, TRVs etc in Viacom 2004).

Response: See response to Comment 81.

Comment 85: Summary: The EPA risk assessment uses very conservative TRVs, based in some cases on unproven principals [*sic*], and consistently makes the more conservative assumption concerning types of receptors. This combination likely overestimates the theoretical risk along Clear Creek. EPA has performed no actual field study to assess if actual effects are occurring in the field. When this conservatism is combined with a lack of understanding about the relationship between PCBs which bypass treatment at ICS and PCB levels in the main stem of Clear Creek fish, use of this risk assessment to justify further action at ICS is unwarranted.

Response: See responses to Comments 80 through 84.

Comment 86: The alternatives analysis is based on a model of the existing spring water treatment system performance at Illinois Central Spring (ICS). The modeled analysis of the existing ICS system can be improved in two ways. a. Re-contamination of the existing plant discharge is acknowledged, but the impact of re-contamination is not quantitatively evaluated. To remedy this, the following are recommended:

- The model should acknowledge recontamination and account for it.
- The existing PCB data (at Quarry Springs combined), which documents the recontamination, should be evaluated to determine if the re-contamination is naturally decaying.
- The point of comparison for the modeled plant performance should be shifted to the "Quarry Springs Combined" location. In other words, the model should be used to reflect how much PCB is discharged to the stream system at the Quarry Springs Combined location. This will more accurately reflect the impact of any alternative on the receiving stream.

Response: EPA disagrees with the commenter. EPA uses its model to calculate the mass of PCBs discharged from the Illinois Central Spring treatment plant. It is true that this water, after being discharged from the plant, enters into a swallowhole where it collects additional PCB contamination from contaminated sediment. Further, it is true that EPA calculation of the total mass released from Illinois Central Spring have been understated in the past because EPA's model does not take into account the effect of this recontamination. Nevertheless, EPA does not agree with CBS's proposal that the model should be revised to reflect the re-contamination caused by the swallowhole. To revise the model, we would need to study the site to develop the following baseline data for the two springs (Rinker and Quarry Springs) that are the discharge points for water entering into the Swallow hole:

1. Base and storm related flow rates independent of the ICS contribution.
2. PCB contributions other than resident effects.
3. PCB concentrations for a given flow rate (i.e. base flow, storm flow)

The best way (if not the only way) to collect this data would be to divert water from the treatment plant around the Swallowhole. Once the diversion was completed, the discharges from Rinker and Quarry springs could be studied in isolation, and the resulting data added to EPA's model. Such an investigation, however, would delay the implementation of the remedy by at least one year. EPA does not believe that this is a reasonable approach, particularly given the fact that the mass of PCBs added by the swallowhole area is likely to be small in comparison to the total mass released from Illinois Central Spring. Instead, EPA believes that the most prudent course of action is to construct a permanent diversion of wastewater around the swallowhole area. A permanent diversion would not be much more expensive than a temporary diversion, and it would obviate the need to delay the remedy as the parties engaged in additional groundwater investigations. Further, such an approach greatly simplifies the environmental problem posed by the site, leaving only Illinois Central Spring as the known source of PCBs from the site. As already noted, EPA's computer model is adequate for determining the mass of PCBs released from Illinois Central Spring.

Comment 87: On page 24 of the proposed plan, in the paragraph describing alternative 3, the EPA states that "During large storm events, water currently overflows the storage tanks and is directly discharged to Clear Creek without treatment". While it is true that tank overflow occurs, it is not true that this occurs "without treatment". It has been proven by both tank overflow sampling during such large storms and tank bottom sediment sampling that there is substantial settlement of PCB contaminated suspended solids in the storage tanks. Thus, it can be said that there is currently treatment of all ICS flows during even the largest events. EPA acknowledges this at other places in the proposed plan and has adjusted their predicted performance of the existing system to account for this. However, EPA has evaluated two very disparate settling efficiencies for the existing storage tanks (0 and 80%). Judgment should be applied to make this information more useful in a quantitative analysis of alternatives. It has been shown that significant PCBs are settling in the tank at least during the largest events (which generate by far the largest fraction of the predicted bypass). Therefore the analysis can be improved by dropping the discredited zero settling case. If EPA is uncomfortable with the 80% settling case, then a more conservative assumption such as 50% settling could be used.

Response: The statement of "without treatment" is a matter of definition and semantics. The U.S. Environmental Protection Agency (EPA) agrees that the storage tanks do retain and provide short-term storage for PCB laden sediments. This is accomplished by settling but no pure form of treatment is performed whereas the PCBs can be removed and handled for disposal. The treatment process within the ICS treatment facility does process the PCB laden water whereas the process does remove PCB in a form that can be handled and disposed of and the waters released without any measurable PCB.

The testing to date suggests that there is a significant amount of PCB retention during larger events but the data is somewhat scattered with respect to the smaller storm events. Though a hypothesis has been developed as to why such variances exist they have not been proven as of this date. The "zero percent" retained is the most conservative use of the data and does provide a measure of what benefits may be derived when comparing operating modes.

Except as an academic exercise, the use of a 50% settling rate has no basis within the current data base and its use would be considered arbitrary.

Comment 88: The combined impact of the above recommendations can be easily evaluated using the existing model and the historic data set for Quarry Springs Combined. For example, refer to Figure 1. This Figure shows the PCB sample results for the Quarry Springs Combined location. From this Figure, two things are evident. First, during the period for which the EPA model is applied (August 2001 through February 2004), the average PCB content of the water at Quarry Springs Combined was about 1 ppb. Second, it appears that the PCB content of the water at this location has declined over time. In fact, if a linear regression of log PCBs vs time is made, time is found to be a highly significant factor ($p<.0003$) with a constant decline rate of about 10% per year. So the clean discharge from the plant is being re-contaminated. But this re-contamination is declining at 10% per year. To apply this information to an evaluation of the PCBs discharged to the Quarry Springs Combined location during the evaluation period (August 2001 through February 2004) simply multiply the total amount of water estimated to have been treated during that time period by the average PCB content for that period (1 ppb). This, combined with how much PCBs are estimated to bypass treatment would provide a better estimate of PCB loading to the Clear Creek system. If we assume 50% settling in the existing tanks, then the PCBs estimated to be reaching the Clear Creek system at Quarry Springs Combined during the period of evaluation is 4.1 kilograms. This would yield an overall treatment efficiency of about 80% for the system during that time period. importantly, the overall system efficiency is improving every year since the re-contamination is decaying. Such an analysis leads to an obvious additional alternative for evaluation which is to maintain the existing system without implementing modifications A and B. Such a scenario would show continual improvement over time up to an overall efficiency of 87% which would represent insignificant re-contamination and bypass of 50% of the PCBs EPA has estimated in their zero settling case. The cost of such a scenario is known with a high confidence level and such a case can then be used as a baseline metric for a cost benefit analysis.

Response: EPA notes that Figure 1 is based on non-storm data collected at the Quarry Springs Combined location. Although EPA does not dispute the findings of the linear regression analysis indicating a 10 percent decline in PCB concentration per year, it is not clear that such an analysis of low flow sampling data could be directly applied to high flow data. EPA does not dispute that the total estimated PCB release through the Quarry Springs Combined location would be about 4.1 Kg for the modeled period if 50 percent PCB removal by the storage tanks is assumed. While the overall system efficiency may improve slightly from year to year due to the declining recontamination, EPA notes that roughly 2.6 Kg of the 4.1 Kg estimated release is direct ICS overflow discharge. No decrease in the PCB concentrations at ICS has been demonstrated. In fact, the peak PCB concentration from the August 30, 2005 storm event at ICS was 1,600 ug/L and is one of the highest concentrations ever recorded at the spring. The fact remains that the spring discharge remains consistently above the 0.3 ppb substantive National Pollution Discharge Elimination System (NPDES) proposed limit.

EPA also notes that without the implementation of Modifications A and B of the Proposed Plan, additional recontamination may be expected from the Quarry A discharge. The commenter's flow data from the August 2005 suggests that the quarry A discharge would be even a higher volume of water to treat than Quarry B if Modifications A and B are not implemented.

Other than noted above, the EPA does not, in general, dispute the numbers presented by the commenter. However, EPA deems it imperative to remove the 4.1 Kg PCB loading that has been projected for a 30 month period and continue to remove such loadings until such time that the PCB concentrations meet the substantive NPDES limits.

Comment 89: EPA has in the proposed plan that all the alternatives it evaluated are protective, including what it has defined as alternative 1, the "no change in the current treatment plant capacity alternative (see page 29). CBS agrees that all the EPA defined alternatives are protective since CBS sees little risk in the status quo, but the implication of all the alternatives being protective is that cost effectiveness should be an important criterion in choosing among the alternatives. It appears that EPA selected alternative 3 based mainly on a criterion associated with the amount of additional PCB mass removed. While this is a consideration, a cost benefit type analysis would balance PCB removal effectiveness with cost.

Response: The selection of Alternative 3 was based upon a number of criterions that are specifically depicted in the screening document titled "Alternative Evaluation" prepared in June 2006. This multidimensional document systemically assessed 198 different operational alternatives with the four most viable alternatives selected for further consideration. The evaluation process provides for the review of the following parameters for each alternative that was considered:

a. Overall Protection of the Human Health and the Environment.
b. Compliances with ARARs
c. Long term Effectiveness & Permanence
d. Reduction of Toxicity, Mobility, and Volume through Treatment

e. Short Term Effectiveness
f. Implementability
g. Cost
h. State Acceptance
i. Community Acceptance

In more than one respect the evaluation of costs has been considered in relationship to the benefits that are afforded. Accordingly the evaluation provided that Alternative 3 provides the greatest overall benefit for the cost that is to be incurred. Further discussion of the selection of Alternative 3 may be found in the ROD Amendment.

Comment 90: Additional alternatives should be evaluated. This would include:
A no action alternative and a status quo alternative. This would involve only running the current plant with no new capital expenditures. EPA has evaluated the cost of this alternative in their alternatives study. A system which would inject powdered activated carbon (PAC) and other settling aids into the current storage tanks combined with storage tank modifications to improve the settling characteristics of the tanks. CBS has performed an initial evaluation of such as system which is shown schematically in Figures 2 through 4. A cost estimate for such a system is shown in Tables 1 and 2.

Response: EPA did provide for the evaluation of a "No Further Action" alternative and a "Status Quo" alternative in its assessment. Please see Response to Comment 56. The current PCB levels within the ICS are greater than the substantive NPDES limits therefore the "No Further Action" was not considered viable. The Maintenance of the Existing Operations (Status Quo) alternative was considered for further evaluation with both the bypass of the "swallow-hole area" and the placement of downstream collection system required due to the PCB levels of the Combined Quarry Springs emergences exceeding the substantive NPDES limits.

EPA evaluated the addition of flocculants and coagulants as part of the Alterative Evaluation. No further assessment of this alternative was considered for the following reasons:

a. Substantial variances in the chemical and physical characteristics of the spring influent.
b. Operator assessment of chemical feed requirements and timing not reliable and time consuming.
c. Ability to uniformly feed coagulants and flocculants
d. Substantial increase in the potential to foul filters
e. Increase in waste and hazardous waste produced.
f. Need to over-feed the system due to variances.
g. Cost of procuring, storing, handling, and purchasing coagulant, flocculants, and carbon.
h. Reduction in storage and/or treatment capacity due to operating tanks in series or the increases in cost for additional storage capacity.
i. Difficulty of assessing short term storm event flows and anticipated volumes.
j. Increase in labor costs and requirement for extended operational times

k. Need for bench studies and identification of flocculants and coagulants for varying conditions and the capability of operators to assess such needs.

For the limited detail provided, EPA has provided a cursory review of the PAC system information provided by the Commenter. EPA is of the opinion that such a system will not be reliable and will be difficult to operate and maintain. In addition to the reasoning afforded above, the system as currently proposed would need to address the following additional cost and operational concerns.

a. The system as currently sized does not address flow rates above 2,600 gpm or the volume of water generated over the course of large single, multiple, or quick return type events.
b. No evaluation or representation has been provided to efficiencies of such a system or its capability to work with extended flows
c. Evaluation of term system efficiencies have not been assessed or evaluated.
d. Assuming that PCB flocked particulates have settled and were retained in the tanks no allowances have been made for the processing, handling, and disposal of the flocked material.

Comment 91: The rational for the design specifications for the preferred alternative, alternative three are not clear and those design criteria may be unnecessarily severe. For example, it is not clear why EPA chose an overflow treatment standard of 95% or a design capacity of 5000 gpm. This appears to be significantly more than that required. Consider the following:

- With a current plant capacity of 1000 gpm, this implies the overall treatment system would have a capacity 6000 gpm. The ICS system has been monitored for flow almost continuously since 1994. There has been no credible flow measured that approaches 6000 gpm. See Table 3 for a summary of peak flows measured since 1995 at the spring. The highest value on Table 2 is for the May 1995 event and this flow was estimated based on correlations with rain (the measurement weir was overtopped during this event rendering the measured data unusable). The highest credible ICS flow rate measured was a spring flow of about 4500 which would require an overflow treatment system of 3500 gpm. Therefore it appears that a capacity of 5000 gpm for an overflow treatment system is a significant over design based on historical records. While larger events than those measured during the last 11 years will undoubtedly occur, those events will be extremely rare and importantly would still be largely treated by a system with less capacity.

- For example, an overflow treatment system sized for 2600 gprn can be evaluated using the EPA model. During the evaluation period of 2.5 years, only one storm event would have had any significant PCB bypass with a 2600 gprn system (see Figure 5). Even though there would be some PCBs that bypass treatment during that one event (January 2004), the actual amount of bypass would be very small and is easily calculated using the EPA model. If you assume that the overflow treatment system treats all waters overflowing the tanks during that event up to 2600 gpm, and you assume an overflow treatment efficiency of 95% (as the EPA has in its analysis), then the amount of PCBs bypassing overflow treatment during the 2.5 year period would be 167.7 grams assuming no settling in the existing tanks. This would yield an overall capture efficiency of 98% percent (assuming no settling in the tanks). If you assume 80% settling in the tanks, the overall treatment efficiency is well over 99% for the 2600 gpm capacity system during this 2.5 year period.

- EPA may have chosen 95% removal efficiency as a standard for overflow treatment based on the testing done to date on overflows. However, this testing was very limited and likely would not show the continued performance of such a system over a period of several days of overflow. Over a more extended time period, solids loading to carbon vessels can cause performance issues such as excessive head loss, channeling, solids migration through the bed and carbon blinding. The latter three effects can cause degradation in removal efficiencies. CBS believes that the 95% standard is overly restrictive and may not be achievable even with carbon without proper pre-filtration.

Response: Bullet No. 1

EPA notes that the estimated peak flow of 5,385-gpm for the May 18, 1995 event is consistent with Earth Tech's model 25-year, 6-hour storm event which predicts a peak flow rate of 5,403 gpm. EPA's opinion is that such flow rates are likely to occur again. A simple probability plot of maximum annual discharge for the 11 year period of record in the commenter's Table 3 suggests that the 25-year recurrence peak would be between 5,500 and 6,000 gpm. This is in good agreement with the design storm.

The commenter further suggests that the May 1995 flow rate data that they present is not credible and unusable. No evidence is provided for this opinion. To the contrary, EPA estimates that the flow rate may have been greater than estimated. As indicated below, the flow rate at the time was reduced by restriction in the culvert under the RR tracks that led to upstream storage of storm water. Currently, no such restrictions exist and the same storm event that occurred in May 1995 may actually produce flow rates in excess of 5,385 gpm. Even if the May 18, 1995 value is not considered credible, as the commenter suggests, a probability plot still suggests a 25-year recurrence peak flow above 5,000 gpm. Use of short term historical flow rates for the purpose of defining design values is a valuable tool but it is not appropriate to use these absolute values for defining the design capacities as suggested by the commenter.

EPA contends that the design capacity of 1000-gpm primary treatment and 5000 gallon secondary treatment capacity is appropriate given observed flow rates, predicted future flow rates, and EPA's desire to minimize to the extent reasonably possible (without expenditure of maximum cost) the release of PCBs to clear creek.

The treatment and storage components are part of the overall system that provides related but different functions for the ICS. The evaluation and assessment of the combined treatment and storage capacity is based on engineering parameters, empirical relationships, costs, experience, regulations, and the evaluation of data. Accordingly various combinations were evaluated to determine the most effective combination of the two components.

The treatment system must be able provide the following functions:

1. Process PCB laden water to meet specific discharge criteria.
2. Process water over a range of flows whereas the system is capable of treating within discharge limits the base, low, and high flows without damage to the operating systems.
3. Process stored water whereas the storage capacity is regained prior to the next event. Accepted practice is restore 100% of the design storage capacity within seven (7) days of the single storm type event.
4. Remove the constituent of concern (COC) and provide a means to handle and properly dispose of the material.

The storage systems must be able to provide the following functions:

1. Store water in sufficient quantity to allow the treatment system to properly operate within its given range.
2. Allow for bypass of waters that exceed the storage capacity.
3. Store and retain the COC within the limits of storage.
4. Prevent short circuiting of the system.
5. Return the stored waters, sediments and COC at a rate that can be properly treated prior to release.
6. Operate within a defined range for the given hazard.

The system and its various components were designed from storm data collected by the commenter. With the use of SCS standardized hydrographs an empirical model was developed to determine the design flow and sump capacities. A 25 yr-6 hr ICS storm event was selected to design the facility. The 25yr-6hr (4% chance of occurrence for any given year) design event was selected because of its common regulatory use with projects involving hazardous materials.

The ICS karst system is a complex network of solution paths, cavities, crevices, and caves that can provide a full array of hydraulic anomalies depending on the stage of groundwater passing through the system for any given flow rate. Because the flows cannot be calculated using conventional hydraulic models, the EPA elected to use a comparative analysis using the short term historical rainfall and flow data collected by the commenter. The use of actual data would account for changes in flow conditions (gravity, pressure conduits, pools, submerged entrance and outfall, etc.) whereas the hydraulics could be calculated and applied to a standard SCS unit hydrograph. Once the application was made the hydrograph was linearly expanded to determine the design flows and volumes that could be expected. For the ICS the 25yr-6hr storm event was developed from the unit hydrograph with peak flow rate of 5,400 gpm. Given the relative low flows (1300 gpm +/-) used in the analysis to calculate the peak flow with the variables and unknowns associated with the karst system, a ten (10%) percent increase in the peak flow was applied (5, 830 gpm).

The peak flow of 5,830 gpm is for a single event storm that mirrors the peak and volume of water for an equivalent SCS Type II storm event. Because the karst system is unique and may not compare well to the basic parameters of a SCS unit hydrograph with its various soil conditions, pools, areas of deposition and other related parameters, the design flow rate was rounded to 6000 gpm. Other related storm parameters that were acknowledged but not considered at the time of design were multiple storm events where the karst system had not drained from previous events, quick return storm events, and changes in the surface features whereas sink holes, swallow-holes, land use and other related causes may influence the hydraulic profile.

Since the ICS Treatment Facility was brought on-line in May 2000 the facility has bypassed approximately 10,000 gallons of "raw" spring water through the Spring Receiving Sump (SRS) emergency overflow. This bypass was due to a programming error and not an equipment failure or capacity issue. Measured flows by the commenter prior to ICS Facility commissioning have exceeded 5300 gpm and since commissioning of the facility single storm event flow rates have been as high as 4,500 gpm.

The commenter has a limited understanding of the use of the treatment and storage components of the existing ICS facility. The nominal treatment capacity is 1000 gpm and the nominal storage capacity is approximately 1.2 million gallons. The storage component can be fed at a rate 5000 gpm and can overflow at a rate of 5000 gpm but this system is not capable of treating or storing such an event without modification.

The primary treatment system is an active system that can treat an average of 1000 gpm but its capacity to continually treat waters diminishes with time for a given event depending on the skill of the operator, the system's condition at the outset, and the quality of constituents in the effluent. With extended run times the granular activated carbon (GAC) filters within the treatment component develop a backpressure and will typically need to be backwashed one time over the course an event. During this time the treatment system is not operable and all flow is through the storage tanks.

The storage tanks currently receive 2,500 gpm or 5,000 gpm per cycle. Accordingly, any treatment units receiving the overflow from the storage tanks would need to match the overflow potential of the storage tanks. The SRS Tank overflows could occur during the following events:

1. Inflow to the SRS is greater 1000 gpm and the storage capacity is used.
2. The primary treatment system is off line and he storage capacity has been expended.
    a. equipment failure
    b. backwashing cycles
    c. control failure
    d. certain alarm condition

Bullet No. 2

EPA believes it is appropriate to design for an overflow rate based on an anticipated 25-year recurrence interval. As the commenter suggests, for small storms the storage tanks may be expected to buffer the overflow rate to some value below the peak spring discharge. That is, the peak spring discharge occurs at a time when the tanks are filling, and the maximum overflow rate occurs at a time after the peak. For larger storms this is not the case. The commenter is referred to Appendix A, Figure 14 of the June 2006 Alternative Evaluation Report. For the January 6, 2005 storm event illustrated in the figure, the peak discharge of 4,300 gpm occurred when the tank system was completely full. The overflow rate, accounting for a 1,000 gpm plant treatment rate was therefore 3,300 gpm. This storm appears to have been only a 4 or 5 year recurrence interval storm based on the historic spring flow record.

Bullet No. 3

The GAC filters proposed for the SRS Tank overflow have a capacity of 1,000 gpm per vessel or a total capacity equal to 8,000 gpm. EPA recognizes that solids could potentially create a back pressure on the units reducing there flow capacity. The use of the individual GAC units provides a level of redundancy whereas the filters can be brought on line or off line as the flows change allowing the filters to be backwashed as required without loosing the capacity to treat the overflow. The use of the multiple filters allows them to remain in service longer with the capacity to renew the filters before they would become fouled. Based on the 25yr-6hr design event with an average overflow of approximately 4400 gpm, seven units would be needed to maintain a flow capacity of 650 gpm or more until a backwash cycle (½ hr.) was complete. This is well within the operating range of the GAC units.

As part of the design the GAC train is part of a filtering system that provides a 15 micron Average Opening Size (AOS) filter. This filter will retain solids with courser particles introduced at the beginning of a storm event when the flows are higher. As the storm peaks the solids loading will decrease with the flow rate and the size of particles will continue to decrease with the overflow. This natural progression will allow the GAC units to continue to filter finer particles than the 15 micron AOS allowing a greater retention of PCB laden sediments. It is EPA's opinion that the 95 percent removal standard is appropriate and achievable whether applied as an average across a year or to individual storm events.

The modeling used in Alternative 3 was specifically designed to observe the potential for blinding the surface of the GAC filter. Over the course of the test, no measured head loss was observed through the media and the filter did not show a propensity to foul or blind over during the course of the testing. A layer of fine particles was observed throughout the filter with notable discoloration in the upper ½ inch of the model.

Comment 92: The estimated cost for Alternative 3 in the proposed plan is likely underestimated. First, the estimate assumes no filtration is required in front of the carbon vessels. This is an unproven assumption that if wrong would have significant implications on the cost of this alternative. CBS has contacted a carbon filtration system company and a feed stream with 9 to 74 ppm of suspended solids (EPA data from 1/5/2005 testing) is a concern for carbon system removal efficiency. Until proven otherwise via pilot testing, it is more reasonable to assume that both pre-filtration and backwash capability will be necessary to consistently achieve the desired removal efficiency. CBS has otherwise evaluated the cost estimate prepared for alternative 3 and feels the following modifications are warranted (these cost adders are summarized in Table 4, Table *5* is a cost estimate for a 2600 gpm overflow treatment system with carbon vessels):

a. Filtration in front of the carbon vessels should be included until proven unnecessary. For planning purposes at this time, the cost for an inclined plate settler is added.

b. The influent pipe from the storage tank and the effluent pipe will be a minimum of 18" diameter to convey the 4,500 gpm. The price for this pipe should be closer to $1 OO/LF versus the $25 listed.

c. Variable frequency drives for the GAC feed pumps are not listed.

d. The valves and piping required to connect the GAC units are not listed.

e. The cost for the flow meters appears to be low. For the size of piping required (12" & 18") the cost could be significantly higher.

f. The GAC adsorber tank cost appears to be too low. Based on discussions with Calgon, the capital cost for five model 12 systems is $950,000 including installation and first load of GAC. This will add about $325,000 to the estimate.

g. The bypass pipe is shown at $25/LF. This should be at least $1 OO/LF for this size pipe.

h. The line item for valves is listed as $12,500. This will buy about four valves. This should be at least doubled to account for the 5 GAC systems.
i. The electrical costs appear low. These costs should be closer to $40,000 to $50,000.

j. The startup costs are listed at $10,000 which may be too low. Since it will be started and operated during rain events, use approximately $25,000 for the startup cost.

Response: In the Alternatives Evaluation report, EPA presented estimated capital costs for the Alternative 3 conceptual design. The capital costs were estimated in Table 3-1 to be $1,255,000. In Exhibit D, CBS indicated that a number of line items in Table 3-1 were underestimated. Based on these comments, EPA evaluated comments and agrees that EPA's costs may be between 15% and 20% low but with within the range for a conceptual design as described in the Alternatives Evaluation Report.

However, we disagree that it is appropriate to assume that suspended solids removal is required prior to GAC filtration. It is EPA's opinion that such clarification will not be required considering that Alternative 3 includes backwashing capability. In any event, the clarifier proposed by CBS in Table 4 as a necessary element of the Alternative 3 remedy will not be of any benefit since Earth Tech's studies consistently show through Imhoff cone testing that all settleable solids are removed in the storage tanks.

Comment 93: Rinker Spring has no proven relationship to the Lemon Lane site. CBS may choose to include collection of this spring water but reserves the right to maintain that it is not connected to Lemon Lane Landfill discharges.

Response: It is currently the intention of the EPA to construct Modification B, as presented in the AE Report, to collect the flow from Rinker Spring and pump it to the ICS treatment system.

Comment 94: Pumping back Rinker and Quarry Springs is only warranted during non-storage tank overflow conditions. This is because the PCB content of these springs is a fraction of that issuing from ICS. The option to not collect Rinker or Quarry Spring waters during periods when the storage tanks are overflowing should be left open pending further evaluation. The option to not collect these waters at all should also be considered after the impact of cleaning the sediments around the swallow hole and moving the plant discharge.

Response: As of this date, insufficient data has been provided to assess the PCB contribution of Rinker and Quarry Springs (Quarry Combined) during storm flow. The EPA is willing to consider the direct discharge to stream if it can be shown that the Quarry Combined springs contribute a consistently lower PCB loading than the discharge from the treated SRS tank overflow. The EPA is willing to consider the decommissioning of the Quarry Combined spring collection and pumping system if the Substantive NPDES requirements are maintained below the established limits as prescribed by the EPA.

Comment 95: A cost benefit analysis should be performed since maintenance of the status quo appears to be protective of human health and the environment. The costs have been reasonably well determined. But some additional discussion is required to identify the net benefits which should be attributed to each alternative. While one benefit could be described in terms of total PCB mass captured by each alternative, it is not clear how to attribute the incremental environmental benefit for PCB mass captured. A sample cost benefit analysis in terms of mass of PCB captured is shown in Tables 6 and 7. As can be seen from these Tables, most of the mass of PCBs is currently being captured by the existing system. Therefore any additional modifications to capture the remaining relatively small mass which bypasses the current system will have a very high incremental cost per additional pound of PCB captured. CBS questions whether it is reasonable to invest in additional systems that would yield an incremental cost of approximately $83,000 per pound of PCBs.

Response: EPA does consider nine criteria during the process of evaluating alternatives. Accordingly cost is one of the parameters that is evaluated and is used with the remaining criterion when considering recommendations for a final remedial action. Accordingly, EPA has found Alternative 3 best meets the overall objectives including the cost to implement this action for this site. The commenter may need to reevaluate the cost per pound of PCB removed but more importantly review the other considerations that comprise a cost to benefit study.

Comment 96: The EPA has projected cost for 30 years for each alternative. While this is a standard method for comparing alternatives, it ignores the reality that the ICS will likely continue with levels of PCBs which the EPA would deem requires treatment for a substantially longer time. The only conceivable way to prevent this is to continue evaluating source removal or control in the bedrock at the landfill. CBS has been and is committed to continuing this approach with its conduit investigation. CBS has made substantial progress over the years locating bedrock deposits of PCB DNAPL which is surely the source of the PCBs which emerge at ICS. While EPA acknowledges this in the proposed plan, this approach is not recognized or evaluated as a viable alternative. It is more reasonable to put additional moneys into this approach over the next few years than spend millions of additional dollars on expensive end of the pipe treatment that will have a very high incremental cost per pound of PCB captured, may have little effect on the PCB content of fish in the main stem of Clear Creek and will not resolve the restore the contaminated groundwater in any reasonable time period.

Response: The commenter is encouraged to continue its studies and develop its hypothesis but in the mean time the PCB emerging from the ICS area needs to removed from the environment. The commenter acknowledges in the preamble of his comment that PCB's will likely continue for a period of time longer than 30 years, accordingly, the commenter would possibly benefit from any means or technology that could be used to control or remove the PCB within the next 30 years. Unfortunately, the PCB contamination is deeply rooted into the bedrock and along various karst features whereas the source is no longer just the Lemon Lane Landfill but the entire karst system extending from the Lemon Lane Landfill to below the ICS. Given the depth of contamination, the vast extent of the spatial area (karst and surface) that contains elevated PCB levels, the constant and continued release of PCBs into the environs, and the fact that a source type solution has been sought for the last seven years and the problem known for over 20 years with no imminent solution proposed or available, and with the lack any other viable alternative being implemented; the EPA will not allow the PCB releases to continue to adversely effect the human and environmental resources. EPA is of the opinion that it is time to move forward with a final remedy. In the event that the commenter's efforts do provide a definitive solution to the release of PCBs from the ICS and the Quarry Combined springs, then EPA is committed to reopen the water remedy.

Comment 97: National Pollution Discharge Elimination System (NPDES) program requirements of the Clean Water Act (CWA) are neither applicable, nor relevant and appropriate, requirements for the Illinois Central Spring on-site water treatment plant. First, the Commenter states that it agrees with EPA that NPDES permit requirements are not applicable. Next, the Commenter states that the substantive NPDES requirements are not relevant and appropriate for the water treatment plant, because the NPDES requirements regulate the "discharge of pollutants" (defined as the addition of pollutants to navigable waters) from a "point source." In this case there is no NPDES-regulated "discharge of pollutants," because the proposed plant would not add pollutants to those already occurring as a result of existing groundwater and surface water flows. In short, "NPDES requirements are very ill-suited to the Lemon Lane Landfill Superfund Site, which is very different from the situation in which they would normally apply. The NPDES requirements are intended to apply to the "discharge of pollutants," which is a defined term with a specific meaning under that statute. 33 U.S.C. §§ 1311, 1362(12). The term "discharge of a pollutant" is defined to mean "any addition of any pollutant to navigable waters from any point source." 33 U.S.C. § 1362(12). This definition does not apply to the ICS Treatment Facility because no "addition" of a pollutant is involved.

Response: EPA disagrees with the comment. The NPDES program requirements of the CWA are relevant and appropriate requirements for an on-site water treatment plant at Lemon Lane Landfill's Illinois Central Spring water treatment plant.

As the lead agency for the site, EPA is charged by 40 C.F.R. § 300.400(g) with identifying applicable or relevant and appropriate requirements to the release or remedial action contemplated for the site. As the commenter correctly notes, EPA determined that the NPDES program requirements of the CWA were not "applicable" to the Illinois Central Spring water treatment plant. This is because Section 121(e) of CERCLA, 42 U.S.C. § 9621(e), specifically exempts on-site removal and remedial actions, such as the water treatment plant, from the permit requirement imposed by the NPDES program. Nevertheless, EPA determined that the substantive requirements of the CWA were "relevant and appropriate" to the plant (and its proposed expansion as part of the final remedial action). Specifically, EPA determined that 327 IAC 5-2-11.1, which sets forth the procedure for establishing a water-quality based effluent limits (WQBEL) for various pollutants including PCBs, was "relevant and appropriate" to establishing the effluent limit for PCBs discharged by Lemon Lane Landfill's Illinois Central Spring water treatment plant.

The Commenter argues that substantive requirements of the NPDES Program are not "relevant and appropriate" because the proposed water treatment plant will not be subject to the CWA. The Commenter's argument confuses the difference between requirements that are "applicable" and those that are merely "relevant and appropriate." Even if a requirement is not "applicable," EPA is nevertheless required to determine whether a regulation may be relevant and appropriate to the circumstances of the release. 40 C.F.R. § 300.400(g)(2). A "relevant and appropriate" requirement means "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that . . . *address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site*." 40 C.F.R. § 300.5 (emphasis added). EPA believes that the substantive requirements of the NPDES program are "well-suited" to the cleanup at Lemon Lane Landfill's Illinois Central Spring and the water treatment plant, because the NPDES Program, similar to the proposed CERCLA action, is concerned with abating the harmful effects of pollutants discharged into the nation's waterways.

Under 40 C.F.R. § 300.400(g)(2), EPA is required to examine eight factors, where pertinent, to determine whether a requirement addresses problems or situations sufficiently similar to the circumstances of the release or remedial action contemplated. Id. An examination of these factors (below) shows that EPA reasonably determined that the substantive requirements of the NPDES Program, including 327 IAC 5-2-11 and 327 IAC 5-2-11.1 (the reference to 327 IAC 5-2-11.2 appears to be a typographical error repeated throughout), were "relevant and appropriate" to the proposed waste water treatment plant.

Factor 1: The purpose of the requirement and the purpose of the CERCLA action: The objective of 327 IAC 5-2-11.1 is to establish water quality based effluent limits for pollutants discharged into waters other than those within the Great Lakes system. The State of Indiana has established water quality criteria to restore and maintain the chemical, physical and biological integrity of the waters of the state. Pertinent to the present case, the State has determined that the concentrations of PCBs in Indiana waterways shall not exceed .79 parts per trillion ("ppt"). Based upon this water quality criteria, the State has also determined, in accordance with the guidelines set forth at 327 IAC 5-2-11.1, that dischargers of PCBs cannot discharge PCBs at a concentration greater than .3 parts per billion (ppb).

The problem addressed by 327 IAC 5-2-11.1 is similar to the circumstances of the remedial action proposed by EPA for Lemon Lane Landfill's Illinois Central Spring and the water treatment plant. Here, PCBs from the site were being released into Clear Creek, thus requiring the treatment plant, and continue to be released from the plant during certain storm events, thus necessitating this Lemon Lane Landfill water treatment operable unit. To protect human health and the environment from these releases, EPA has proposed, among other things, expanding the treatment capabilities of the water treatment plant to capture and treat the PCB-contaminated water (which now bypasses the plant during large storms) before it is discharged into Clear Creek. A critical question in implementing this remedial action concerns the amount of PCB reduction that is necessary. That is, EPA must determine what concentration of PCBs can be discharged into Clear Creek without threatening human health and the environment. The procedure set forth at 327 IAC 5-2-11.1 is directly relevant to answering this question, and it is therefore appropriate for EPA to use 327 IAC 5-2-11.1 in selecting the proposed final remedy for both the treatment plant discharge criteria and the discharge criteria for treated spring water that currently bypasses the treatment plant.

Factor 2: The medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site:

The State of Indiana's NPDES Program, including 327 IAC 5-2-11 and 327 IAC 5-2-11.1, is concerned with protecting the waters of the State from the harmful effects of pollutants, such as PCBs. Similarly, the proposed remedial action is concerned with protecting Clear Creek - one of the State's waterways - from the harmful effects of PCBs. This factor, therefore, supports EPA's determination that State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Factor 3: The substances regulated by the requirement and substances found at the Site:

The State of Indiana's NPDES Program, including 327 IAC 5-2-11 and 327 IAC 5-2-11.1, regulates the discharge of "pollutants," which includes PCBs. PCBs are also the contaminant of concern with respect to the proposed remedial action. Therefore, this factors also supports EPA's determination that the State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Factor 4: The actions or activities regulated by the requirement and the remedial action contemplated at the CECRLA site:

Like all NPDES program, the State of Indiana's NPDES Program regulates the "discharge" of pollutants into the State's waters. Section 503(12) of the CWA, 33 U.S.C. § 1362(12), defines the "discharge of a pollutant" in relevant part to mean "any addition of any pollutant to navigable waters from any point source." Here, the Lemon Lane Landfill's Illinois Central Spring and its water treatment plant are similar to a "point source" if it is not, in fact, a point source. EPA believes, therefore, that these circumstances at the site are similar enough to the activities regulated by the State NPDES program that the substantive requirements of that program are "relevant and appropriate" to the proposed remedial action.

Section 503(14) of the CWA, 33 U.S.C. § 1362(d), defines the term "point source" to mean "any discernible, confined and discrete conveyance . . . from which pollutants are or may be discharged." Cases brought under the CWA establish that the term "point source" is to be broadly construed. Dague v. City of Burlington, 935 F.2d 1343, 1354-55 (2d Cir. 1991); Albahary v. City and Town of Bristol, Connecticut, 963 F.Supp. 150, 152-53 (D. Conn. 1997). The term not only includes pipes or ditches, but also large land areas, such as strip mining pits and mine tailing ponds. In Washington Wilderness

Coalition v. Hecla Mining Company, 870 F.Supp. 983 (E.D. Wa. 1994), the Court held that two dirt-filled mine tailing ponds and a third, active, unlined mine tailing pond from which contaminants were leaching could be point sources. Similarly, in Sierra Club v. Abston Construction, 620 F.2d 41, 45 (5th Cir. 1980), the Court held that a strip mine was a point source where "the miner at least initially collected or channeled the water and other materials" that eventually resulted in a discharge into a navigable body of water. See also Beartooth Alliance v. Crown Butte Mines, 904 F.Supp. 1168, 1174 (D. Mont. 1995)("This Court finds that Glengarry Adit, McLaren Pit, and Como Pit are 'discernable, confined and discrete' conveyances constituting point sources.").

All of these cases support the conclusion that the Lemon Lane Landfill, Illinois Central Spring, and its water treatment plant, are point sources. The Lemon Lane Landfill occupies a sinkhole filled with garbage and commercial and industrial waste including capacitors and PCB-containing dielectric fluids. The addition of these materials and wastes changed the surface and subsurface of the land and directed the flow of water or otherwise impeded its progress. As result of these activities, PCBs are now discharged from the Illinois Central Spring site into Clear Creek, and hence, the site is a "point source." Further "point sources" are the culvert under the Illinois Central Spring railroad railbed, which channels water emerging from the Illinois Central Spring before it goes to the Illinois Central Spring water treatment plant. This culvert is not the original culvert that the spring water flowed through, because that culvert needed to be replaced as part of the removal action. The fact, is however, that even before the removal action the water was channeled as a result of human actions through a railroad culvert qualifying as a point source. Dague v. City of Burlington, 935 F.2d 1343 (2d Cir. 1990). Finally, the Illinois Central Spring water treatment plant itself is a point source.

A second argument made by the commenter is that discharges from the water treatment plant are not "discharges" under the CWA. Specifically, the commenter argues that the purpose of plant, and its proposed expansion is to *reduce* the concentration of PCBs entering into Clear Creek. Since the plant is not *adding* pollutants to Clear Creek, the commenter maintains that the effluent discharged by the plant does not qualify as a "discharge" for the purposes of the CWA.

This argument overlooks the fact that the site, not the plant, is adding pollutants to Clear Creek. If the commenter's argument were correct, then a publicly owned treatment works (POTW) would not need to obtain an NPDES permit because a POTW does not add pollutants to the waste stream that flows through the plant. Rather, a POTW merely removes pollutants from the wastestream. Numerous courts, however, held that POTWs are subject to the NPDES program.

Factor 5: Any variances, waivers, or exemption of the requirement and their availability for the circumstances at the CERCLA site

Under 327 IAC 2-1-8.8, the State may grant a variance from a water quality standard used to derive a WQBEL for a specific substance. In making this determination, the State must balance the increased risk to human health and the environment if the variance is granted against the hardship or burden upon the applicant if the variance is not granted. This determination is similar to the one that EPA made in selecting the proposed remedial alternative. Specifically, EPA found that the proposed remedial action was the best choice taking into account a number of factors, including cost. For the same reasons set forth in the proposed plan as to why Alternative 3 is the best choice among remedial alternatives, EPA believes that the variance under 327 IAC 2-1-8.8 should not be granted in the present case. Likewise, EPA believes that various exemptions available under its own regulations should not be granted here.

Factor 6: The type of place regulated and the type of place affected by the release or CERLA action:

As already noted, the State NPDES Program regulates dischargers of pollutants into the States' waterways. Similarly, under the proposed remedial action, EPA seeks to clean up a site that is discharging pollutants into a State waterway. Accordingly, this factor supports EPA's determination that State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Factor 7: The type and size of structure or facility regulated and the type of size of structure or facility affected by the release or contemplated by the CERCLA action:

As already noted, the State NPDES Program regulates "point source" of pollutants discharged into the State's waterways. Lemon Lane Landfill; the Illinois Central Spring railroad culvert, and the Illinois Central Spring water treatment plant are all consistent with the sizes and types of point sources regulated under the Clean Water Act. The conclusion that the Lemon Lane Landfill, as well as the railroad culvert are themselves each point source is directly supported by Dague v. City of Burlington, 935 F.2d 1343 (2d Cir. 1990)(holding city landfill was a point source). Likewise, the proposed water treatment plant is consistent with the size and type of facilities that are routinely subject to the requirements of the NPDES Program. Accordingly, this factor supports EPA's determination that State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Factor 8: Any consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resource at the CERCLA site.

The requirements of 327 IAC 5-2-11.1 apply to all waterways in the State that are not part of the Great Lakes System, regardless of the use or potential use of the waterway. Accordingly, this factor supports EPA's determination that State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Comment 98: EPA and the State of Indiana have failed to identify specific effluent limitations for specific hazardous substances, pollutants, and contaminants and, instead, has identified only broad programmatic requirements. Thus, EPA and the State have failed to properly identify CWA requirements as ARARs.

Response: The commenter is incorrect. EPA refers the commenter to EPA's response to Comment 99 below. Further, there are sample results reflecting the presence of a hazardous substances or pollutants or contaminants other than PCBs in the water emerging from the Lemon Lane Landfill's Illinois Central Spring. Specifically, the sample results show low levels of volatile organic chemicals at the Illinois Central Spring. The State, however, has not yet identified any additional substantive NPDES requirements for those constituents.

Next, the State has identified its NPDES permit modification regulation (327 IAC 5-2-16(c)(2) and 5-2-16(d)(2)) as an ARAR and as a basis for being able to impose an effluent limit or other requirement for any such hazardous substance or pollutant or contaminant that is later identified (as well as a basis to identify newer methods for quantifying PCB concentrations). EPA agrees that while this may be the way the State handles discovery of additional contaminants (or newer quantification methodologies) at an NPDES-permitted facility, under Superfund EPA handles the discovery of additional contaminants, newer quantification methodologies, the inadequacy of existing treatment technologies, and other matters that may establish that a remedy is not protective, through amendments or other changes to its selected remedy using its remedy amendment process. The discovery of additional contaminants, newer quantification methodologies, or the inadequacy of existing treatment technologies may be raised to U.S. EPA at any time, and U.S. EPA's five year review process is one forum in which such matters may be formally raised and addressed. Thus, if additional hazardous substances or pollutants or contaminants are found to be in the water emerging at the Lemon Lane Landfill's Illinois Central Spring (or new PCB-quantitation methodologies are identified), and if these facts are raised to U.S. EPA, then it may be necessary to modify the selected ground water remedy to establish effluent limits or other additional requirements using EPA's processes for amending or otherwise altering a remedy selected in a record of decision.

Comment 99: Regarding PCBs, EPA and the State have not identified a legally enforceable effluent limitation that qualifies as an ARAR. Instead, EPA and the State rely on 327 IAC 5-2-11 and 327 IAC 5-2-11.1 as the vehicle to set an effluent limit of 0.3 parts per billion (ppb), because that is the limit of quantitiation (a level which can be reliably confirmed using existing measurement technology) using existing technology. The 0.3 ppb effluent limitation for PCBs does not qualify as an ARAR, because it has not been "promulgated" by the State as a regulatory standard.

Response: Indiana properly identified 327 IAC 5-2-11 and 327 IAC 5-2-11.1 as ARARs and used 327 IAC 5-2-11.1 as the promulgated standard, requirement, criteria, or limitation to set an effluent limit of 0.3 ppb for PCBs. With respect to State ARARs, 42 U.S.C. § 9621(d)(2)(A)(ii) provides that

> "any promulgated standard, requirements, criteria, or limitation under a State environmental . . . law that is more stringent than any Federal standard, requirement, criteria, or limitation . . . is legally applicable to the hazardous substance or pollutant or contaminant concerned or is relevant

and appropriate under the circumstances of the release of such hazardous substance or pollutant or contaminant, the remedial action selected . . . shall require, at the completion of the remedial action a level or standard of control for such hazardous substance or pollutant or contaminant which at least attains such legally applicable or relevant and appropriate standard, requirement, criteria, or limitation."

This provision does not require that a State's "promulgated standard, requirements, criteria, or limitation under a State environmental . . . law" take the form of a specific, promulgated numeric effluent limit. Rather, it simply requires that the "standard, requirements, criteria, or limitation" identified as an ARAR be promulgated. Here, 327 IAC 5-2-11.1 is the relevant and appropriate standard, requirement, criteria, or limitation promulgated by Indiana. 327 IAC 5-2-11.1(f) in pertinent part provides:

> (f) When the WQBEL for any substance is less than the limit of quantitation normally achievable and determined by the commissioner to be appropriate for that substance in the effluent, the permit shall contain the following provisions:
> (1) The permittee shall be required to use an approved analytical methodology for the substance in the effluent to produce the LOD and LOQ achievable in the effluent. The analytical method, and the LOD and LOQ associated with this method, shall be specified in the permit in addition to the following requirements:
> (A) The permit shall include conditions that state that effluent concentrations less than the limit of quantitation are in compliance with the effluent limitations.
> (B) In addition, the permit shall require the permittee to implement one (1) or more of the following requirements:
> (i) Develop a more sensitive analytical procedure.
> (ii) Use an existing, more sensitive, analytical procedure that has not been approved by EPA.
> (iii) Conduct studies to determine the bioaccumulative or bioconcentrative properties of the substance in aquatic species through caged-biota studies or fish tissue analyses of resident species.
> (iv) Conduct effluent bioconcentration evaluations.
> (v) Conduct whole effluent toxicity testing.
> (vi) Other requirements, as appropriate, such as engineering assessments or sediment analyses.
> For substances defined as BCCs, at a minimum, either item (iii) or (iv) shall be included in the permit.
> (2) If the measured effluent concentrations for a substance are above the WQBELs and above the LOD specified by the permit in any three (3) consecutive analyses or any five (5) out of nine (9) analyses, or if any of the additional analyses required under subdivision (1)(B) indicate that the substance is present in the effluent at concentrations exceeding the

WQBELs, the permit shall contain provisions that require the discharger to:

(A) determine the source of this substance through evaluation of sampling techniques, analytical/laboratory procedures, and industrial processes and wastestreams; and

(B) increase the frequency of sampling and testing for the substance.

(3) The permit shall contain provisions allowing the permit to be reopened, in accordance with section 16 of this rule, to include additional requirements or limitations if the information gathered under subdivisions (1) and (2) indicates that such additional requirements or limitations are necessary.

Here, the WQBEL for PCBs is 0.001 part per billion, which is below the limit of quantitation and limit of detection normally achievable and determined by the commissioner to be appropriate for PCBs. As a result, in accordance with the promulgated requirements of the NPDES program, the State set the effluent limit for PCBs at 0.3 ppb, which is the level at which concentrations of PCBs can be reliably quantified.

In identifying 327 IAC 5-2-11.1 as an ARAR, Indiana properly and timely identified a "promulgated standard, requirements, criteria, or limitation under a State environmental . . . law" and through application of that standard, requirements, criteria, or limitation derived the 0.3 ppb PCB effluent limitation.

EPA also notes that in its footnote 12 (Comment Letter at 17), CBS identifies a 3 pbb effluent limit taken from EPA Toxic Substances Control Act Spill Policy regulations (40 C.F.R. § 761.79(b)(1)(ii) as a higher (less stringent) limit than the "unpromulgated" limit of 0.3 pbb identified by the State. EPA concludes that the Stale limit of 0.3 pbb derived from application of Indiana's promulgated standard, requirements, criteria, or limitation at 327 IAC 5-2-11.1 is more stringent than the Federal requirement and, therefore, will be used.

Comment 100: PCB effluent limits that could be calculated pursuant to 327 IAC 5-2-11 and 327 IAC 5-2-11.2 (the reference to 327 IAC 5-2-11.2 appears to be a typographical error repeated throughout) also are not ARARs, because those levels are not verifiable using existing technology, and where numerical limits are infeasible, EPA can instead establish conditions to reduce pollutants to an acceptable level by, for example, using best management practices to control or abate the discharge of pollutants.

Response: The commenter appears to be suggesting that PCB effluent limits other than the 0.3 ppb effluent limit could be calculated pursuant to 327 IAC 5-2-11 and 327 IAC 5-2-11.1. Whether or not this is true is immaterial. Based upon consultations with the State, EPA has determined that the proposed remedy will comply with ARARs under the State's NPDES program if, among other things, the proposed treatment plant meets or exceeds a discharge limit of 0.3 ppb. This discharge limit is verifiable using existing technology.

Comment 101: EPA should use "best management practices," consistent with 40 C.F.R. § 122.44(k)(2), to control or abate the discharge of pollutants, because numeric effluent limits are infeasible here. Further, the 0.3 ppb PCB effluent limit, if it is an ARAR, should be waived under 42 U.S.C. § 9621(d)(4)(C) on the basis that it is technically impracticable to meet this limit from an engineering perspective.

Response: First, numeric effluent limits are feasible here, and have been identified. Therefore, it is not appropriate for EPA to rely on "best management practices," consistent with 40 C.F.R. § 122.44(k)(2), alone to control or abate the discharge of pollutants instead of the numeric limit. EPA agrees that adoption of some best management practices is appropriate here.

Second, EPA declines to consider a technical impracticability waiver for 327 IAC 5-2-11.1 and the effluent limit of 0.3 ppb PCBs. Given the water flows and volumes at the Site, designing, constructing, and operating a water treatment plant that captures and removes PCBs to an effluent of 0.3 ppb is practicable from an engineering perspective. Indeed, the water treatment plant designed and constructed by EPA at the Illinois Central Spring Site consistently treats PCBs to this level.

EPA agrees, however, that a technical impracticability waiver is appropriate for criteria that would otherwise apply to PCB-contaminated storm water flows that currently bypasses the 1,000 gpm treatment plant. Thus, the PCB-contaminated storm water flows that are treated by the additional remedial components identified in alternative 3 do not have to achieve the States NPDES criteria.

Comment 102: The 0.3 ppb PCB effluent limit should also be waived under 42 U.S.C. § 9621(d)(4)(E). This provision "authorizes EPA to waive State ARARs when they are not consistently applied by the State."

Response: There is no basis for providing this type of waiver here. The State timely identified 327 IAC 5-2-11.1 and the 0.3 ppb PCB effluent limit (which is based on current testing methodology reliability limitations). Indiana has demonstrated an intention to consistently apply 327 IAC 5-2-11.1, and EPA is unaware of examples of the State of Indiana being inconsistent in its application 327 IAC 5-2-11.1. Accordingly, EPA is unaware of a basis for waiving 327 IAC 5-2-11.1 and a 0.3 ppb PCB effluent under 42 U.S.C. § 9621(d)(4)(E).

Comment 103: In addition to Table 1 in 327 IAC 2-1-6, the other Indiana NPDES provisions identified in the Proposed Plan are not ARARs for the following reasons:

IAC Code Provision	**Requirement**	**Reason(s) why not an ARAR**
327 IAC 5-2-8(3)	Permittee shall take all reasonable steps to minimize or correct	(1) There is no permit; and (2) this is no "standard, requirement, criteria, or

	noncompliance with the permit	limitation" under 42 U.S.C. § 9621(d)(2).
327 IAC 5-2-8(5)	Allows IDEM to institute proceedings to modify permit if more stringent limits are determined for toxic pollutants	(1) There is no permit to modify; (2) this is not a substantive requirement in a permit, but a procedural provision relating to IDEM's administration of the program; and (3) under CERCLA, 42 U.S.C. § 9621(d)(2)(A), (4), and the NCP, 40 C.F.R. § 300.430(f)(1)(ii)(B), ARARs are fixed at the time of remedy selection.
327 IAC 5-2-8(6)	Permit does not convey a property right of any sort	(1) There is no permit; and (2) This is not a "standard, requirement, criteria, or limitation" under 42 U.S.C. § 9621(d)(2)(A).
327 IAC 5-2-8(7)	Permittee shall provide a right of access to IDEM and its contractors	(1) There is no permit; (2) This is not a "standard, requirement, criteria, or limitation" under 42 U.S.C. § 9621(d)(2)(A); and (3) CBS does not own or lease the property in question.
327 IAC 5-2-8(8)	Permittee shall maintain the facility in good order	(1) There is no permit; and (2) this is not a "standard, requirement, criteria, or limitation" under 42 U.S.C. § 9621(d)(2)(A).
327 IAC 5-2-8(9)	Permittee's tampering with monitoring device is subject to criminal sanction	(1) There is no permit; (2) This is not a "standard, requirement, criteria, or limitation" under 42 U.S.C. § 9621(d)(2); and (3) enforcement provisions are not ARARs.
327 IAC 5-2-8(10)	Establishes reporting requirements	Reporting requirements for CERCLA remedies are set forth in consent decrees or other enforcement documents
327 IAC 5-2-8(11)	Requirements for bypass	EPA has already indicated that it intends to invoke

		CERCLA's technical impracticability waiver to supersede these requirements.
327 IAC 5-2-8(12)	Requirements for upset	EPA has already indicated that it intends to invoke CERCLA's technical impracticability waiver to supersede these requirements.
327 IAC 5-2-8(13)	It shall not be a defense in an enforcement action for a permitee to argue that it would have to halt operations to maintain compliance with a permit	(1) There is no permit; (2) This is not a "standard, requirement, criteria, or limitation" under 42 U.S.C. § 9621(d)(2)(A); (3) enforcement provisions are not ARARs; and (4) this provision makes no sense in this context, because the only "operations" involved are those to implement the remedy.
327 IAC 5-2-8(14)	Provisions relating to signing of reports and criminal sanctions for false reports	(1) There is no permit; (2) This is not a "standard, requirement, criteria, or limitation" under 42 U.S.C. § 9621(d)(2)(A); (3) procedural and enforcement provisions are not ARARs; and (4) these issues are generally addressed separately in a consent decree or other enforcement document.
327 IAC 5-2-11(a)(1)-(4)	Definitions of "Average Monthly Discharge," "Average Weekly Discharge," "Continuous Discharge," and "Daily Discharge," used in calculating effluent limitations.	Definitions are not in and of themselves "standard[s] requirement[s], criteria, or limitation[s]" under 42 U.S.C. § 9621(d)(2), and therefore not ARARs.
327 IAC 5-2-11(a)(5)(C)	Method of calculation for daily discharges	This methodology is not in and of itself a "standard, requirement, criteri[on], or limitation" under 42 U.S.C.

		§ 9621(d)(2), and therefore not an ARAR.
327 IAC 5-2-11(c)(2)	Provision relating to waste load allocation based on production capacity	This provision has no relevance to this treatment system: *there is no production going on.* It is neither applicable nor relevant and appropriate.
327 IAC 5-2-11(d), (e), (f), (g) and (h)	Provisions relating to the calculation of effluent limitations	These provisions relate to the calculation of effluent limitations. Even if the effluent limitation is an ARAR, the means by which it is calculated are not themselves ARARs. The term ARAR in 42 U.S.C. § 9621(d)(2)(A) refers to the specific "standard, requirement, criteri[on], or limitation" itself, not the means by which it was determined.
327 IAC 5-9-2(a), (c), (d), (e)	Refers to best management practice programs for "ancillary manufacturing operations"	There are no "ancillary manufacturing operations" in this situation. This provision is not an ARAR, because it is not applicable or relevant and appropriate under CERCLA. It is ill-suited for this situation.
327 IAC 5-9-2(b)	Defines "manufacture" to mean the production of an intermediate or final product	(1) There is no production of an intermediate or final product in this situation; this provision is not an ARAR because it is not applicable or relevant and appropriate under CERCLA; and (2) a definition is not a "standard, requirement, criteri[on], or limitation" under 42 U.S.C. § 9621(d)(2)(A).
327 IAC 5-9-2(f)	Discusses requirements for a best management practices program in a permit application	(1) There is no permit and no permit application; and (2) this is not a "standard, requirement, criteri[on], or limitation" under 42 U.S.C.

		§ 9621(d)(2)(A).
327 IAC 5-9-2(g)	Procedural requirement for modifying best management practices plan	(1) This is not a substantive requirement of a permit, but a procedural provision relating to IDEM's administration of the program; and (2) under CERCLA, 42 U.S.C. § 9621(d)(2)(A), (4), and the NCP, 40 C.F.R. § 300.430(f)(1)(ii)(B), ARARs must be identified and are fixed at the time of remedy selection.
327 IAC 5-9-2(h)	Discharger will maintain a copy of a best management practices plan at the facility and make it available to IDEM on request	This is not a substantive requirement of a permit, but a procedural provision relating to IDEM's administration of the program.
327 IAC 5-9-2(i)	Discharger will amend the best management practices when there is a change to the system that affects the discharge	(1) This is not a substantive requirement of a permit, but a procedural provision relating to IDEM's administration of the program; and (2) under CERCLA, 42 U.S.C. § 9621(d)(2)(A), (4), and the NCP, 40 C.F.R. § 300.430(f)(1)(ii)(B), ARARs must be identified and are fixed at the time of remedy selection.
327 IAC 5-9-2(j)	Provision relating to the amendment of best management practices plan if it proves ineffective	(1) This is not a substantive requirement of a permit, but a procedural provision relating to IDEM's administration of the program; and (2) under CERCLA, 42 U.S.C. § 9621(d)(2)(A), (4), and the NCP, 40 C.F.R. § 300.430(f)(1)(ii)(B), ARARs must be identified and are fixed at the time of remedy selection.

327 IAC 5-2-13(a), (c), (d), (e), (f)	Monitoring provisions	These provisions are not ARARs in and of themselves.
327 IAC 5-2-16(c)(2)	This provision relates to the modification of a permit due to the promulgation of more stringent effluent limitations	(1) This is not a substantive requirement of a permit, but a procedural provision relating to IDEM's administration of the program; (2) under CERCLA, 42 U.S.C. § 9621(d)(2)(A), (4), and the NCP, 40 C.F.R. § 300.430(f)(1)(ii)(B), ARARs must be identified and are fixed at the time of remedy selection; and (3) there is no permit.
327 IAC 5-2-16(d)(2)	This provision relates to the modification of a permit	(1) This is not a substantive requirement of a permit, but a procedural provision relating to IDEM's administration of the program; (2) under CERCLA, 42 U.S.C. § 9621(d)(2)(A) (4), and the NCP, 40 C.F.R. § 300.430(f)(1)(ii)(B), ARARs must be identified and are fixed at the time of remedy selection; and (3) there is no permit.

Response: U.S. EPA agrees that the following sections of the Indiana Administrative Code are not ARARs for the Site, the Illinois Central Spring water treatment plant, or its expansion as described in Alternative 3: 327 IAC 5-2-8(5), (6), and (13); 327 IAC 5-2-11(c)(2); 327 IAC 5-9-2(b), (g), and (h); 327 IAC 5-2-16(c)(2) and (d)(2).

EPA disagrees with the comment that the other cited Sections are not ARARs. The Commenter's observation that many of the sections cited in its title are neither applicable, nor relevant and appropriate, because no NPDES permit is associated with the Site is rejected. Although no NPDES permit is required for the Site, the requirements cited are still relevant and appropriate, because, as will be discussed more fully below, they provide "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that . . . *address problems or situations sufficiently* *similar to those encountered at the CERCLA site that their use is well suited to the particular site.*" 40 C.F.R. § 300.5.

327 IAC 2-1-6 identifies the minimum surface water quality standard and establishes surface water quality criteria for specific substances, including PCBs. This provision is relevant and appropriate in determining cleanup and discharge criteria, and is directly tied to determining the discharge criteria for PCBs under 327 IAC 5-2-11.1.

327 IAC 5-2-8(7), (8), (9), (10), (11), (12), and (14) all establish standards of control and other substantive requirements and criteria relevant and appropriate to determining the operation of the Illinois Central Spring water treatment plant, as well as the system for treatment of storm water that currently bypasses the water treatment plant. 327 IAC 5-2-8(7) establishes the substantive requirement of IDEM access to the plant, and is relevant and appropriate to ensuring EPA's and IDEM's ability to provide oversight of plant operations. 327 IAC 5-2-8(8) establishes the substantive requirement that the water treatment plant and its equipment be kept in good working order and operated efficiently and is relevant and appropriate to ensuring the plant's operation and ability to achieve the cleanup standards. 327 IAC 5-2-8(9) and (10) establishes the substantive requirement that the operation of the water treatment plant and its equipment be monitored and identifies reporting requirements and sanctions for false reporting and is relevant and appropriate to the plant's operations and ability to achieve the cleanup standards, as well as ensuring EPA's and IDEM's ability to conduct oversight. 327 IAC 5-2-8(11) and (12) establish the substantive requirements for handling circumstances where "bypass" or "upset" occur at the water treatment plant, and are relevant and appropriate to ensuring the plant's operation and ability to achieve the cleanup standards. 327 IAC 5-2-8(14) establishes substantive reporting requirements and sanctions for false reporting and is relevant and appropriate to the plant's operations and ability to achieve the cleanup standards, as well as ensuring EPA's and IDEM's ability to conduct oversight.

327 IAC 5-2-11(a)(1)-(4) and (5)(c); 327 IAC 5-2-11(d),(e),(f) (g), and (h) establish cleanup standards, standards of control, and other substantive requirements, criteria, or limitations under state environmental laws that address the situation at the site by providing a way for calculating, establishing, and specifying effluent limits and their use is well suited to this Site. These requirements are relevant and appropriate to ensuring the plant's operation and ability to achieve the cleanup standards.

327 IAC 5-9-2(a), (c), (d), (e), (f), (i), and (j) establish cleanup standards, standards of control, and other substantive requirements, criteria, or limitations under state environmental laws that address the situation at the site by providing a way for determining, establishing, and specifying best management practices applicable to the Illinois Central Spring water treatment plant and the plan for treating water that currently bypasses the plant as described in Alternative 3 effluent limits and is well suited to this Site. These requirements are relevant and appropriate to ensuring the plant's operation and ability to achieve the cleanup standards.

327 IAC 5-2-13(a), (c), (d), (e), (e), and (f) establish substantive monitoring requirements and are relevant and appropriate to the plant's operations and ability to achieve the cleanup standards, as well as ensuring EPA's and IDEM's ability to conduct oversight.

Comment 104: CBS has stated that air emission provisions identified by IDEM are not ARARs. In the Fact Sheet, EPA notes that the State has identified as ARARs three requirements relating to major sources of hazardous air pollutants (HAPs). These requirements are plainly inapplicable and not relevant and appropriate. One requirement, 326 IAC 2-4.1, applies to major sources of HAPs. But, based on the description of the remedial alternatives in the Fact Sheet, there is no proposal to construct a major source of a HAP. The second requirement, 326 IAC 2-5.1-3(a)(1)(D), applies to sources of HAPs which have the potential to emit ten (10) tons or more of a HAP in a year, and the third requirement, 326 IAC 2-5.1-2(a)(1)(A), applies to sources of HAPs which also have the potential to emit five tons or more of particulate matter. Again, no such source is contemplated. Accordingly, these requirements should not have been designated as ARARs. These requirements are not only wrongly identified as ARARs, but by identifying them, EPA has created the false impression that air emissions from the proposed remedies are more extensive than contemplated.

Response: The identified ARARS above could, under some circumstances, be relevant and appropriate for Alternative 3. Under 326 IAC 2-4.1, any owner or operator who constructs a major source of hazardous air pollutants (HAP) shall comply with the requirements of this section. PCBs are a HAP. Thus, this section is relevant and appropriate to the extent that the selected remedy would involve the construction of a major source of HAP. Under 40 C.F.R. § 63.41, the term "construct a major source" means to fabricate, install or erect a new process or production unit which emits or has the potential to emit 10 tons per year of any HAP. EPA does not anticipate that any of the proposed remedies would meet this threshold limit.

Under 326 IAC 2-5.1-3(a)(1)(D), a source of HAP that has the potential to emit ten tons per year of HAP must apply for a construction and operating permit. A Source with lower emissions is exempt. To the extent that any of the proposed remedies would have the potential to emit ten tons per year of HAP, the remedy must comply with the substantive requirements of a permit, although no permit would be issued for the site.

Finally, under 326 IAC 2-5.1-2(a)(1)(A), a source of HAP that has the potential to produce five tons per year of either particulate matter or particulate matter less than 10 microns in size, must apply for a registration. A source with lower emissions is exempt. To the extent that any of the proposed remedies have the potential to meet or exceed this threshold limit, the remedy must comply with the substantive requirements of the registration rule, although registration will not be required for the site. EPA does not anticipate that any of the proposed remedies will meet this threshold.

Comment 105: Commenter requests an additional public meeting before EPA makes its final decision so more technical dialogue is on the record.

Response: EPA sees no need to schedule another public meeting. The public comment period was extended 30-days to allow for additional public comments and EPA has held a number of Community Information Committee meetings to foster technical dialogue..

Comment 106: EPA's proposed list of alternatives is not essentially the full list of alternatives. The better alternative involves complete removal of PCBs at the Lemon Lane site. It's the initial proposal selected by EPA that became part of the Consent Decree and later abandoned by EPA, Westinghouse/CBS, the state, and the city without public involvement after the incineration remedy was abandoned.

Response: EPA evaluated complete excavation in the 2000 Proposed Plan. The commenter is correct that complete excavation was part of the original remedy in the Consent Decree but it also included the construction of an incinerator which was rejected. The public has been involved through numerous public meetings and the use of a Technical Assistance Grant. The commenter is referred to the Responsiveness Summary for the source control operable unit for further discussion on why complete removal of the entire landfill was rejected in 2000.

Comment 107: The water treatment alone is not supported by science and the absence of that additional removal of the existing PCBs....unfortunately, this new action is going to capture and treat some of the PCBs, but it's not going to stop releases to a level that is protective of public health. LaMoreaux 1984 and Powell 1984 offer opinions that essentially there is no way to control PCB releases from karst systems such as Lemon Lane without complete excavation of the PCBs. We believe there is only one alternative to effectively work and that is complete excavation and removal to the extent feasible without regard to cost to the polluter, CBS.

Response: EPA will be treating nearly 100% of the water from ICS and treating PCBs from both Rinker and Quarry Springs to levels that are protective. A large amount of information has been gathered since 1984. The investigation has shown that the southeast portion of the landfill is producing the PCBs that are released at ICS. Monitoring within the landfill has not shown that water is moving into the landfill waste under the cap. CBS did remove PCBs down to rock, and in some areas excavated rock in the southeast portion of the landfill. The depth of the PCBs in the rock along with the difficulty excavating over a large area, including under railroad tracks and within a cemetery has forced EPA to focus its efforts on water treatment.

Comment 108: Karst is inherently unpredictable and groundwater flow may be flowing in a different direction and a different volume next year with PCB releases that are not being treated by the plan being proposed by EPA.

Response: A monitoring program will be developed to ensure that the remedy remains protective of public health and the environment. In addition, EPA evaluates the protectiveness of the site remedy every 5 years.

Comment 109: EPA states one of the goals is to reduce the amount of PCBs, which is a kind of nebulous goal. The question is, how much should PCB releases be reduced and how much can they be reduced. We cannot afford any exposure that is preventable and should be prevented. Reduction is not enough. Reduction to the maximum extent feasible and this proposal does not do that.

Response: EPA disagrees with the commenter. EPA's selected alternative will treat nearly 100% of the PCB contaminated water at ICS and removing over 99% of the PCB mass. The additional removal of contaminated sediment at the ICS emergence, swallowhole and quarry springs area should also help to reduce PCB concentrations in fish over time.

Comment 110: Although EPA may once again assert that it has done an analogous RI/FS, at a minimum we would have to see a comparison in writing of the feasibility and the pros and cons and risks of complete excavation of the remaining PCBs, which might involve in situ treatment of residual PCBs that cannot be excavated, compared to your water treatment alternatives. Without providing any detailed scientific analysis comparing complete removal to EPA's preferred alternative proposed here, EPA cannot legitimately say that what they are doing is anywhere close to the RI/FS equivalent.

Response: EPA did complete an RI/FS equivalent and the large amount of investigation and analysis completed is documented in the Administrative Record. As described in the source control operable unit, even removing all the landfill would still require large scale water treatment. The commenter fails to recognize the results of the conduit study which clearly shows PCBs deep in rock in the southeast portion of the site are producing the PCBs during low and storm events. The difficultly in excavating rock, including excavating under railroad tracks and in a cemetery along with the difficulty in finding technology to treat PCBs in-situ has focused EPA's efforts on water treatment. Complete excavation and in-situ treatment will not be evaluated further. CBS does plan to investigate the southeast portion of the landfill further to see if operation and maintenance costs of the water treatment plant may be reduced over time. If additional remedial measures are implemented, a new ROD Amendment would be required.

Comment 111: We disagree with Dr. Clark's position that PCB air releases from the Bloomington sites and from a water treatment process creates a negligible risk. We believe the risk is substantial not just because of inhalation but also uptake in plants from PCB vapors and deposited in the food chain and eventually being consumed by humans. We also believe EPA is not allowed by law to ignore impacts on human health beyond the Bloomington community from the PCB releases through air to the extent that Bloomington is contributing to the current high level exposure to humans nationwide or worldwide for PCBs and related compounds.

Response: EPA believes it is impractical to conduct a theoretical modeling exercise on the amount of PCBs previously released to the air from area landfills or from the Lemon Lane water treatment plant. Such an analysis is subject to great uncertainty and it is extremely difficult to translate such evaluations into levels present on local vegetation.

Similarly it is also very difficult to predict with any reasonable certainty what health impacts, if any, might occur beyond the Bloomington community, due air releases from the Bloomington sites or water treatment plant.

Historical air releases of PCBs, a small fraction of that released to the water, would have occurred but it improbable that amounts deposited from the air onto local vegetation and into the food chain would give rise to exposure levels measurably higher than those already occurring due to background air deposition resulting from global PCB use and dispersion. It should be recognized that the removal of thousands of tons of PCB wastes from the Bloomington area will reduce PCB releases to the air and address risk pathways which are more important to protect public health and wildlife. Removing these PCBs will also reduce the any contributions to national and global exposures which might result from the Bloomington sites.

PCB contamination of local vegetation and resultant risks of human exposure are orders of magnitude of less concern than are exposures which may occur from (1) fish consumption (2) direct ingestion of soils contaminated by capacitors, sludges and other wastes or (3) growing of garden vegetables in soils contaminated by wastes. EPA has made clear that the highest risks come from the consumption of fish and as a result has taken action to reduce PCB levels in wastewater discharges. Tests on drinking waters show no PCBs. The commenter is referred to PCB air monitoring data in the Administrative Record for the results of the air sampling at the ICS water treatment plant the calculation of risks associated with those concentrations.

Comment 112: EPA probably knows this well, but the public may not, current infants born today that are breast fed receives about 60 to 93 picograms per kilogram per day of PCBs and dioxin-like compounds in terms of dioxin toxic equivalents. This is based on EPA documentation. This is for an average infant. EPA reference doses for dioxin-like compounds is 1 picogram per kilogram per day. A breast-fed infant is now getting on average 60 to 93 times that reference for a virtually safe dose.

Response: U.S. EPA and HHS are fully aware that breast fed infants receive dioxin and PCB doses, as TEQ, greater than the current EPA reference dose. However, the reference dose is based from seven years to a lifetime of exposure and does consider exposures during early life stages. Therefore, it probably is not appropriate to compare exposures during the first year or two of life to the reference dose. It should also be noted that exposure levels have been declining.

Comment 113: We ask EPA to collect PCB data on air releases at the ICS emergence point and at the release point of other springs, and that the data be combined with data on PCB releases from the treatment process and that more data be collected if necessary. Also EPA should collect air data on PCB releases from Clear Creek and the water bodies that receive PCB releases, and that a total calculation be conducted for how much PCBs have been released in the air in the past and are being released on an ongoing basis.

Response: EPA has no plans to collect additional PCB air data at the ICS emergence or within the Clear Creek. EPA did complete a large amount of sampling at the ICS water treatment plant both outside and inside the building. The commenter is referred to the Administrative Record for the complete results and a calculation of risk. Doing additional air sampling at the ICS emergence considering that the water flows directly into a culvert and then into the ICS sump would not produce meaningful results. The sampling outside the sump and directly above the sump in the enclosed building provides a much better understanding of the air risk by PCB volatilization.

Comment 114: EPA violated their own action level for PCB air standards during the cleanup in October 2000, in some cases for inhalation risk of 20 to 30 times with concentrations at 2,000 to 3,000 nanograms per cubic meter. This wouldn't have happened if PCBs weren't capable of being released in the air readily. The presence of moisture exacerbates that risk.

Response: EPA acknowledges that PCBs did volatize and implemented many measures to address the volatilization during the excavation at Lemon Lane. EPA did a risk assessment based upon those air levels and did air modeling to determine depositional areas. The very large PCB concentrations in the waste material as high as 30,000 parts per million do not compare with levels in water. EPA has seen levels as high as 1.6 parts per million PCBs in water during a peak in a storm event but most of the time water concentrations are under 100 parts per billion.

Comment 115: EPA's risk assessment did not include a breast-fed infant scenario, as the breast-fed infant and developing fetus are the most sensitive population and most exposed. If EPA wants to really be conservative, it needs to address these populations in the risk assessment.

Response: It is difficult to develop a quantitative breast-fed infant scenario which has sufficient certainty for risk assessment purposes. U.S. EPA acknowledged that children do receive higher doses and provided hazard indices which were two or three times those of adults.

Comment 116: We recommend EPA makes sure that, before it makes its final decision, that its risk assessments are fully informed by the Westinghouse worker study and by EPA's new dioxin reassessment work.

Response: U.S. EPA has been actively tracking these studies and will consider them in final decision making.

Comment 117: EPA references in the proposed plan to waiving what EPA considers to be ARARs for the NPDES for PCBs. If this is not true for Option 3, please inform me. We certainly recommend that EPA not waive one of the federal law protections that we have against PCB discharges to water.

Response: EPA is waiving the substantive requirements for the storage tank overflow treatment system. The commenter is referred to the ROD Amendment for a discussion on the TI Waiver and the reason for waiving the NPDES substantive requirements.

Comment 118: We're not sure EPA has the authority to waive the Clean Water Act requirements from this state because I believe the ARARs concept only applies to on-site actions. The point of discharge for most of this water is not within the boundaries of the Lemon Lane National Priorities site. Therefore, EPA may not be able to waive that requirement.

Response: The commenter is incorrect. EPA considers the Lemon Lane water treatment plant as an on-site action and only the substantive requirements of the permitting process are required. The water treatment plant is in close proximity as described in the National Contingency Plan and the contamination is contiguous from the landfill to the spring, therefore it is considered an on-site action.

Comment 119: EPA's proposed PCB reduction of 99 percent might reassure people, but if you do capture that amount and the system is as effective as EPA states, that still leaves about one percent of PCB releases into the environment. What is the expected risk and harm from leaving about a one percent release of PCBs into the environment? If you update the assessment with EPA's EDO 1s levels for non-cancer effects, you're still going to get an unacceptable risk for non-cancer effects by using EPA's own calculations. By EPA's chosen method in its current proposal, it's not protective of human health and the environment.

Response: EPA cannot clarify the risk of the 1% since it would only be speculative. The commenter provides no basis for the statement that the non-cancer effects would be unacceptable. EPA is of the opinion that the water treatment plant by treating nearly 100% of the water and removing 99% of the PCB mass is protective of human health and the environment.

Comment 120: We know from Fish and Wildlife Service that there are high levels of PCBs in the fish in the Bloomington area. Apparently EPA does not consider sediment to be a significant reservoir of PCBs, not enough to remediate it. That means the PCBs in fish are coming from ongoing releases from the site, not from historical reservoirs of PCBs in sediment. That means the only way to stop the fish from being so contaminated is to eliminate those ongoing releases.

Response: EPA is addressing these releases through the addition of the stormwater storage treatment system and the treatment of both Rinker and Quarry springs.

Comment 121: Westinghouse/CBS/Viacom has been looking for the magical groundwater conduit for about eight years now without success. We'd like EPA to answer how much money did CBS spend looking for that magic conduit, and how much would it have cost for CBS to have funded a full RI/FS over the past eight years?

Response: EPA does not have an estimate of the cost of the conduit study but the results of this investigation has helped to justify the need for water treatment and has demonstrated that PCBs are as much as 70 feet below the top of rock in the southeast portion of the site. EPA has completed an RI/FS equivalent.

Comment 122: What is happening with this contaminated sediment that is collected on these filters used during the water treatment process? EPA noted they are being tested. What is the testing to be done, what is the trigger for being treated at a toxic facility or a hazardous waste facility, and where else might these contaminated sediments be going?

Response: The solids that are being generated from the water treatment plant will be handled as described in the operations and maintenance plan. They are tested using the toxicity characteristic leaching potential test and PCBs are also tested in the sludge. Depending on the results determines the type of landfill disposal. The stormwater storage treatment system solids will also be handled in the manner. If the concentration is greater than 50 ppm PCBs, then a chemical waste landfill is used. If less than 50 ppm PCBs, then the sludge is disposed of a landfill permitted to accept PCBs less than 50 ppm PCBs. In addition, under Superfund, material disposed of in any off-site landfill must be in compliance with all State Local and Federal regulations.

Comment 123: How effective has the water treatment process been in the past for removing PCBs? EPA would be more accurate in determining the removal efficiency of the treatment process….I'm trying to determine how much of the PCBs that are released from the spring at the point of emergence actually gets captured? How much of the PCB in the water that gets treated still escapes the treatment process? Also, how much of the PCBs that didn't make it into the treatment process because they volatilized before the water entered the treatment process? We have not seen EPA calculations answering this question and would like to see this data as you can't determine how much of the PCBs that escape the landfill are being treated without having that data.

Response: EPA has sampled the air both in the building and outside of the building and determined that the PCB levels during low flow and storm events were not producing an unacceptable risk. The water treatment plant will meet the NPDES substantive requirements. EPA has no plans to complete a theoretical exercise since the plant is not producing unacceptable air risks and will meet the substantive NPDES requirements.

Comment 124: We recommend that the proposed remedy be changed to a complete removal of PCBs to the maximum extent feasible. First PCBs should be removed from soil. Then test the epikarst and see how much PCBs can be removed, pumped out, or treated in place. Then the first step might be to remove some stone, if necessary, to access the remaining reservoir. We do not believe there is any alternative to this admittedly difficult and admittedly expensive proposition.

Response: EPA disagrees with the commenter. The commenter has failed to understand the PCB deep within the rock in the southeast portion of the site are source of the PCBs at ICS. The comment that the first step might be to remove some stone does not take into consideration the results of the CBS conduit study. In addition, CBS spent 7 years trying to figure out a way to pump at the landfill without success. The remedies implemented will be protective of human health and the environment.

References – Human Health

ADEM. 1994. *Estimation of Daily per Capita Freshwater Fish Consumption by Alabama Anglers.* Prepared by Fishery Information Management Systems, Inc. and Department of Fisheries and Allied Aquacultures for Alabama Department of Environmental Management (ADEM). Montgomery.

Anderson, A.C. and J.C. Rice. 1993. Survey of fish and shellfish consumption by residents of the greater New Orleans area. Bulletin of Environmental Contamination and Toxicology. 51:508-514.

ChemRisk. 1991. Penobscot River Creel Survey. McLaren/Hart-ChemRisk, Portland, ME. November.

ChemRisk. 1996. Letter from R. Keenan and N.W. Harrington to Kevin Garrahan, U.S. EPA re: Results of Additional Maine Angler Survey Analysis. March 1.

Connelly, N.A., *T.L.* Brown, and B.A. Knuth. 1990. New York Statewide Angler Survey 1988. New York State Department of Environmental Conservation, Division of Fish and Wildlife, Albany, NY. April.

Connelly, N.A., B.A. Knuth, T.L. Brown. 1996. Sportfish consumption patterns of Lake Ontario anglers and the relationship to health advisories. *North American Journal of Fisheries Management.* 16:90-101.

Degner, R.L., C.M. Adams, S.D. Moss, S. K. Mack. 1994. *Per Capita Fish and Shellfish Consumption in Florida.* Prepared by the Florida Agricultural market Research Center for the Florida Department of Environmental Protection. Industry Report 94-2. August.

Ebert, E., N. Harrington, K. Boyle, J. Knight, and R. Keenan. 1993. Estimating consumption of freshwater fish among Maine anglers. *North American Journal of Fisheries Management.* 13:737-745.

Ebert, E.S., S.H. Su, T.J. Barry, M.N. Gray, and N.W. Harrington. 1996. Estimated rates of fish consumption by anglers participating in the Connecticut Housatonic River creel survey. *N. Am. J. Fish. Mngt..* 16:81-89.

EPA. 1989. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A).* U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC. EPA1540l 1-891002. December.

EPA. 1997. *Exposure Factors Handbook.* U.S. Environmental Protection Agency, Office of Research and Development, Washington, DC. EPA/600/(-951002Fa-c). August.

EPA. 2000a. *Estimating exposures to dioxin-like substances: Review Draft.* EPA/600/6-88/005Cc. U.S. Environmental Protection Agency, Office of Research and Development, Washington, DC.

EPA. 2000b. Phase 2 Report, Further Site Characterization and Analysis. Volume 2F -Revised Human Health Risk Assessment, Hudson River PCBs Reassessment RI/FS. Prepared by TAMS Consultants, Inc. for U.S. Environmental Protection Agency Region 2 and U.S. Army Corps of Engineers. November.

EPA. 2003. *Exposure Analysis for Dioxins, Dibenzofurans, and Coplanar Polychlorinated Biphenyls in Sewage Sludge; Technical Background Document.* U.S. Environmental Protection Agency, Washington, DC. October 17.

EPA. 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Final. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation, Washington, DC. EPA/540/R/99/005. July.

EPA. 2005. *Human Health Risk Assessment GE/Housatonic River site, Rest of River.* Prepared by Weston Solutions, Inc. Contract no. DACW33-00-D-0006. February 11.

Javitr, H. 1980. *Seafood consumption data analysis*. SRI International. Final Report prepared for EPA Office of Water Regulations and Standards. EPA contract 68-01-3887.

NYDOH. 1999. *Health Consultation:* 1996 *Survey of Hudson River Anglers, Hudson Falls to Tappan Zee Bridge at Tarrytown, New York.* New York State Department of Health (NYSDOH), Center for Environmental Health. February.

RETEC. 2002. Final Baseline Human Health and Ecological Risk Assessment, Lower Fox River and Green Bay, Wisconsin, Remedial Investigation and Feasibility Study. Prepared by The RETEC Group Inc. December.

Tetra Tech. 2005a. *Human Health Risk Assessment Lemon Lane Landfill, Bloomington, Monroe County, Indiana.* Prepared by Tetra Tech EM Inc., Chicago, IL. Contract Number 68-W6-0037. December 23.

Tetra Tech. 2005b. *Final Technical Memorandum Regarding Stream conditions and Fish Sampling Activities in Clear Creek Lemon Lane Landfill Site, Bloomington, Monroe County, Indiana.* Memorandum from J. Lifka to T. Alcamo, EPA Region 5. April 8.

Turcotte, M.-D.S. 1983. *Georgia Fishery Study: implications for Dose Calculations.* DuPont de Nemours and Co. Report to US. Department of Energy, DE86-008041. Washington, D.C.

Viacom. 2004. Comments of Viacom, Inc. on the U.S. EPA's Human Health Evaluation for Fish Consumption at Neal's Landfill. February 4.

Wendt, M.E. 1986. *Low Income Families' Consumption of Freshwater Fish Caught from New York State Waters.* Masters Thesis. Cornell University. August.

West, P.C., M.J. Fly, R. Marans, F. Larkin. 1989. Michigan Sport Anglers fish Consumption Survey. A Report to the Michigan Toxic Substance Control Commission. Michigan Department of Management and Budget, Contract no. 87-20141.

West, P.C., J.M. Fly, F. Larkin, and R. Marans. 1991. Minority anglers and toxic fish consumption: Evidence from a state-wide survey of Michigan. In: *Proceedings of the Michigan Conference on Race and the incidence of Environmental Hazards* (Bryan and Mohai, eds.).

West, P.C., J.M. Fly, R. Marans, F. Larkin, and D. Rosenblatt. 1993. Michigan sport anglers fish consumption study. Prepared by the University of Michigan, School of Natural Resources for the Michigan Department of Natural Resources, Ann Arbor, MI. Technical Report No. 6. May.

EPA REFERENCES

Agency for Toxic Substance and Disease Registry (ATSDR). 1998. "Toxicological Profile for Chlorinated Dibenzo-p-Dioxins." Public Health Service. U.S. Department of Health Services. December. On-Line Address:

http://www.atsdr.cdc.gov/toxprofiles/tp104-p.pdf

Normandeau Associates, Inc. (Normandeau). 2004. Letter Report Regarding Fish and Crayfish Tissue Sampling for Aroclor and Lipid Analysis at Stout's Creek near Bennett's Dump. Normandeau Project No. 20103.000. From George M. Christian, Project Biologist. To Russ Cepko, CBS Corporation. September 2.

Normandeau. 2006. Letter Report Regarding Fish Tissue Sampling for Aroclor and Lipid Analysis at Conard's Branch and Richland Creek near Neal's Landfill: Fall 2005. From George M. Christian, Project Biologist. To Russ Cepko, Viacom, Inc. (Viacom). February 22.

Tetra Tech EM Inc. (Tetra Tech). 2005. "Human Health Risk Assessment, Lemon Lane Landfill, Bloomington, Monroe County, Indiana. December 23.

Tetra Tech. 2006a. "Human Health Risk Assessment, Bennett's Dump Site, Bloomington, Monroe County, Indiana. January 27.

Tetra Tech. 2006b. "Human Health Risk Assessment, Neal's Landfill Site, Bloomington, Monroe County, Indiana." April 28.

U.S. Environmental Protection Agency (EPA). 1984. "Ambient Water Quality Criteria for 2,3,7,8-Tetrachloro-dibenzo-p-dioxin." Office of Water Regulations and Standards. EPA 440/5-84-007. February. On-Line Address: http://www.epa.gov/waterscience/library/wqcriteria/dioxincriteria.pdf

EPA. 1990. "National Oil and Hazardous Substances Pollutant Contingency Plan (NCP)." *Federal Register*. Volume 55, Number 46. April 9.

EPA. 2000. "Estimating Exposures to Dioxin-like Substances: Review Draft." Office of Research and Development. EPA/600/6-88/005Cc. September.

EPA. 2003. "Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) and Related Compounds, National Academy of Science Review Draft." December. On-Line Address: http://www.epa.gov/ncea/pdf/doxin/nas-review/#part1